START

0029455 184

Mr. John Grantham
State of Washington
Department of Ecology
Nuclear & Mixed Waste Program
P. O. Box 47600
Olympia, WA 98504-7600

FLUOR DANIEL, INC.

Date: July 23, 1992

Reference: Hanford Waste Vitrification Plant
DOE Contract DE-AC06-86RL10838
Fluor Contract 8457

Transmittal No.: WDOE-173

Dear Mr. Grantham:

TRANSMITTAL

We enclose 1 copy of the items listed below. These are issued per US-DOE request.

Response due to Fluor: N/A
Responds to: DOE REQUEST

NUMBER	Rev.	Date	TITLE
SEE TRANSMITTAL ATTACHMENT			P33A PACKAGE STEAM GENERATOR DRAWINGS AND SPECIFICATIONS NOTE: THIS PACKAGE IS ISSUED AFC ONLY. THE RFC ISSUE WILL FOLLOW THE REV 1 ISSUE AS OUTLINED IN CONFERENCE NOTE CN-563, PARAGRAPH 2.10 NOTE: "FOR RCRA PART B PERMIT"

Distribution:
R. L. Long: DOE-RL w/0
VPO/AME Corresp Cntrl Cntr, MSIN A5-10 (P33A),w/0
P. Felise, WHC-RL (MSIN G6-16), w/0
Environmental Data Management Center (MSIN H4-44), w/0
D. Duncan, US EPA, Region X, w/0

Very truly yours,

Rosalie Cadenas for
R. S. Poulter
Project Director

RSP:BED:lt

(b) OPERATING	123,700	LB
(c) FULL OF WATER	125,000	LB

JUL 22 1992

SAFETY CLASS 3

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS
0	7/21/92	APPROVED FOR CONSTRUCTION	

CADFILE B120195A CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE
REV _____ DATE _____
ERO _____

SIGNATURE	DATE
PROJ DIR	20Jul92
QA MGR	7/21/92
INDEPENDENT SAFETY MGR	7/14/92
PROJECT MGR	7/14/92
SYSTEMS MGR	7/20/92
ENGINEERING MGR	7/17/92
SUPERVISOR R. B Erickson	7/17/92
DESIGN ENGINEER	07/11/92
CHECKED	07-16-92
DRAWN C.S.TALLUD	01-15-92

U.S.DEPARTMENT OF ENERGY
Richland Field Office
DE – AC06-86RL10838

FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

TK-430-001 DEMINERALIZED WATER STORAGE TANK

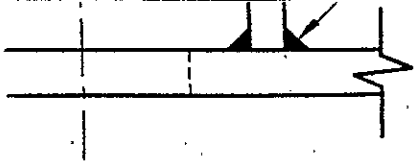
PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P33A
SCALE: NONE	BLDG NO. 13	INDEX NO.

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120195	1	2	0

DISTRIBUTION CODE: 402 ACAD

INITIALS: DLH
DATE: 07/14/92



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SAFETY CLASS 3

JUL 22 1992

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS
0	7/21/92	APPROVED FOR CONSTRUCTION	

B

CADFILE B120195B CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE
REV _____ DATE _____
ERO _____

SIGNATURE	DATE
PROJ DIR	7/15/92
QA MGR	7/21/92
INDEPENDENT SAFETY MGR	7/21/92
PROJECT MGR	7/17/92
SYSTEMS MGR	7/20/92
ENGINEERING MGR	7/17/92
SUPERVISOR R.B. Erickson	7/17/92
DESIGN ENGINEER	07/17/92
CHECKED	07-16-92
DRAWN C.S.TALLUD	02-06-92

CLASSIFICATION: NONE
BY: NOT REQD

U.S.DEPARTMENT OF ENERGY

Richland Field Office
DE - AC06-86RL10838

FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

TK-430-001 DEMINERALIZED WATER STORAGE TANK DETAILS

A

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P33A
SCALE: NONE	BLDG NO. 13	INDEX NO.

DRAWING NUMBER: H-2-120195

SHEET	OF	REV
2	2	0

2 1

AFC
77 78 79 80

DISTRIBUTION CODE: 403

ACAD

INITIALS: DLH
DATE: 07/14/92

PROVIDED BY SELLER BUT NOT INCLUDED IN CONTRACT DOCUMENTS. THESE TAG NUMBERS WILL BE PROVIDED DURING REVIEW OF SELLER'S P&ID.

SAFETY CLASS 3

JUL 22 1992

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
0	7/21/92	APPROVED FOR CONSTRUCTION	a.L.S.	QBC for KCL	QBB	[illegible]
			[illegible]	AKY	[illegible]	LSP

CADFILE B121705A | CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE

REV ______ DATE ______

ERO ______

SIGNATURE	DATE
PROJ DIR [signature]	20JUL92
QA MGR [signature]	7/21/92
INDEPENDENT SAFETY MGR [signature]	7/20/92
PROJECT MGR [signature]	7/17/92
SYSTEMS MGR [signature]	7/20/92
ENGINEERING MGR [signature]	7/17/92
SUPERVISOR QB Bunney	07/17/92
DESIGN ENGINEER KClyer	7/17/92
CHECKED a.L. Sanborg	7/17/92
DRAWN F.L.HOLLSTEIN	03/18/92

U.S.DEPARTMENT OF ENERGY

Richland Field Office

DE – AC06-86RL10838

FLUOR DANIEL, INC.

ADVANCED TECHNOLOGY DIVISION

LP-430-001 INSTRUMENT PANEL LAYOUT

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P33A

SCALE	BLDG NO.	INDEX NO.
NONE	1	

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-121705	1	1	0

2   1

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77 78 79 80

DISTRIBUTION CODE: ACAD   INITIALS: RR   DATE: 17 JUL 92

(b) OPERATING	16,400	LB
(c) FULL OF WATER	17,000	LB

SAFETY CLASS 3 JUL 22 1992

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
0	7/21/92	APPROVED FOR CONSTRUCTION	[illegible]	GW	[illegible]	[illegible]
			BEB	[illegible]	[illegible]	LDP

CADFILE B120160A CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE

REV ______ DATE ______

ERO ______

SIGNATURE	DATE
PROJ DIR [signature]	20JUL92
QA MGR [signature]	7/21/92
INDEPENDENT SAFETY MGR [signature]	7/20/[illegible]
PROJECT MGR [signature]	7/17/92
SYSTEMS MGR [signature]	7/20/92
ENGINEERING MGR [signature]	7/17/92
SUPERVISOR R.B. Erickson	7/17/92
DESIGN ENGINEER [signature]	7/17/92
CHECKED [signature]	7/16/92
DRAWN D.L.HSU	09-05-91

U.S.DEPARTMENT OF ENERGY

Richland Field Office

DE - AC06-86RL10838

FLUOR DANIEL, INC.

ADVANCED TECHNOLOGY DIVISION

TK-430-002 PROCESS CONDENSATE COLLECTION TANK

PROJECT TITLE: HANFORD WASTE VITRIFICATION PLANT

PROJECT	FLUOR CONTRACT NO.	CWBS NO.
B-595	8457	P33A
SCALE: NONE	BLDG NO.: 01	INDEX NO.:

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV
NONE	NOT REQD	H-2-120160	1	1	0

2 1

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DISTRIBUTION CODE: 402 ACAD INITIALS: DLH

DATE: 07/14/92

SECTION 01730
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit operation and maintenance (O&M) data which is specifically applicable to this contract and a complete and concise depiction of the provided equipment or product. Data containing extraneous information to be sorted through to find applicable instructions will not be accepted. Present information in sufficient detail to clearly explain user O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/ Subcontract.

1.1.1 Package Content

For each product, system, or piece of equipment requiring submission of O&M data, submit the package required in the individual technical section. Package content shall be as required in the Paragraph 1.3, "Schedule of Operations and Maintenance Data Packages."

1.2 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.2.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation:

1.2.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.2.1.2 Operator Prestart

Include requirements to set up and prepare each system for use.

1.2.1.3 Start-Up, Shutdown, and Post-Shutdown Procedures

Include a control sequence for each of these operations.

1.2.1.4 Normal Operations

Include control diagrams with data to explain operation and control of systems and specific equipment.

1.2.1.5 Emergency Operations

Include emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.

1.2.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustments, and inspection.

1.2.1.7 Environmental Conditions

Include a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

1.2.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.

1.2.2.1 Lubrication Data

Include lubrication data, other than instructions for lubrication in accordance with Paragraph 1.2.1.6, Operator Service Requirements.

1.2.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventive maintenance man-hours on a daily, weekly, monthly, and annual basis.

1.2.3 Corrective Maintenance

Include manufacturer's recommendations on procedures and instructions for correcting problems and making repairs.

1.2.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.2.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation numbering.

1.2.3.3 Maintenance and Repair Procedures

Include instructions and list tools required to restore product or equipment to proper condition or operating standards.

1.2.3.4 Removal and Replacement Instructions

Include step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.2.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays.

1.2.3.6 Corrective Maintenance Man-Hours

Include manufacturer's projection of corrective maintenance man-hours. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.

1.2.4 Appendices

Provide information specified in the preceding paragraphs pertinent to the maintenance or operation of the product or equipment. Include the following:

1.2.4.1 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.

A. Manufacturer's Standard Commercial Practice: The parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice.

B. Other Than Manufacturer's Standard Commercial Practice (MSCP): End item manufacturer may add a cross-reference to implement components' assemblies and parts requirements when implementation in manual form varies significantly from the style, format, and method of manufacturer's standard commercial practice. Use the format in the following example:

End Item Manufacturer's Alphanumeric Sequence	Actual Manufacturer's Name and MSCP	Actual Manufacturer Part No.
100001	John Doe & Co. 00000	2000002

1.2.4.2 Warranty Information

List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents to keep warranties in force.

1.2.4.3 Personnel Training Requirements

Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly.

1.2.4.4 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.3.1 Data Package

A. Operating instructions

B. Safety precautions

C. Operation prestart

D. Start-up, shutdown, and post shutdown

E. Normal operations

F. Emergency operations

G. Operator Service Requirements

H. Environmental conditions

I. Preventative maintenance

J. Lubrication data

K. Preventive maintenance plan and schedule

L. Corrective maintenance

M. Troubleshooting guides and diagnostic techniques

N. Wiring diagrams and control diagrams

O. Maintenance and repair procedures and manhour requirements

P. Removal and replacement instructions

Q. Spare parts and supply list

R. Parts identification

S. Warranty information

T. Personnel training requirements

U. Testing equipment and special tool information

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 05063
WELDING PRESSURE VESSELS

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, examination and testing requirements for shop fabrication of the steam generator, steam condenser collector vessel and blowdown vessel. The material of construction shall be 304L stainless steel for the steam condenser collector vessel and blowdown vessel. The material of construction shall be carbon steel for the steam generator.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODES

ASME Section II, Part C	1989 Material Specifications-Welding Rods, Electrodes, and Filler Metals
ASME Section V	1989 Nondestructive Examination
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels
ASME Section IX	1989 Welding and Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	1988 Recommended Practice-Personnel Qualifications and Certification in Nondestructive Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	1986 Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS A3.0	1989 Welding Terms and Definitions Including Terms for Brazing, Soldering, Thermal Spraying and Thermal Cutting
AWS D10.11	1987 Recommended Practice for Root Pass Welding of Pipe Without Backing
AWS QC1	1988 Standard and Guide for Qualification and Certification of Welding Inspectors

1.3 **RELATED REQUIREMENTS**

Specification Section 13252	Precautions for the Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 13433	Pressure Vessels Stainless Steel
Specification Section 15620	Electric Steam Generator

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent) or Procedure Qualification Records (ASME Form QW-483 or equivalent) in accordance both with the requirements of ASME Section IX and this specification section shall be submitted for Buyer approval. Submittals shall include a brief summary of the application of individual procedures with regard to types of joints and materials.

1.6.2 Welder Performance Qualifications (ASME Form QW-484 or equivalent) shall be submitted for information. They shall be in accordance with the requirements of ASME Section IX.

1.6.3 All Welding Procedure Specifications, Procedure Qualification Records for purchased items contracted by Seller shall be

submitted to Buyer for approval after review and concurrence by Seller. Welder Performance Qualification shall be submitted for information.

1.6.4 Nondestructive Examination (NDE) procedures for fabricated items shall be submitted for Buyer approval. Fabrication shall not start until these documents are returned to Seller with authorization to proceed.

1.6.5 Certified Material Test Reports (CMTRs) for filler metal shall be submitted for information.

1.6.6 Weld repair procedure shall be submitted for Buyer approval.

1.6.7 Final weld examination and inspection reports shall be submitted for information. These shall include visual NDE reports and radiography film.

1.6.8 Weld maps and weld procedure summary sheet shall be submitted for Buyer approval. They shall specifically identify each weld joint, weld procedure to be used and NDE requirements (sample form in Attachment A).

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Weld filler materials shall be in accordance with ASME Section II, Part C.

2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.

2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal element from the flux. No active fluxes shall be allowed.

2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.

2.1.5 Submerged arc welding shall be performed using the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.

2.1.6 Storage and handling of electrodes, fluxes and other welding materials after shipping containers are opened shall be in accordance with Seller's filler material control procedure. This procedure shall be in accordance both with the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendation.

2.1.7 Tack welds shall be made with the equivalent type of electrode filler wire that is used for the root pass.

2.1.8 Gas tungsten arc welding shall not be performed with filler metal produced in accordance with SFA-5.2 of ASME Section II, Part C.

2.1.9 Low Hydrogen electrodes shall be used for all pressure-retaining welds.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 General Requirements

2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME Code, Section VIII, Division 1. Compliance with this specification section and authorization of Welding Procedure Specifications and Procedure Qualification Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.

2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.

2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.

2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.

2.2.1.5 All weld spatter, burrs, etc., shall be ground to a smooth contour.

2.2.1.6 Arc strikes, weld starts and stops shall be confined to the weld joint. Any arc strikes on base material shall be removed by

light grinding to a smooth contour. If the grinding removes a significant depth of metal (> 1/16 inch) the area shall be back-welded and ground flush.

2.2.1.7 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the vessel surface. The remaining material shall then be ground flush with the base metal. The ground area shall be inspected for possible cracks or porosity by liquid penetrant or magnetic particle examination. Whichever is applicable. Examination shall be in accordance with Paragraph 3.2.5.

2.2.1.8 Nozzles, lugs, support rings and similar items shall not be located on a weld seam unless unavoidable. Buyer authorization shall be required if any attachment is to be located on weld seam.

2.2.1.9 For stainless steel, where double-welded butt joints cannot be utilized, the root pass welds shall be made with the GTAW process. Back purging gas shall be used during welding. The purge shall be maintained until at least 0.250 inch depth of weld metal has been deposited or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.

2.2.1.10 Peening of welds is not permitted.

2.2.1.11 Tack welds in open butt joints shall be feathered into surrounding material.

2.2.2 Welding Qualifications

2.2.2.1 Welding Procedure Specifications, Procedure Qualification Records and Welder's Performance Qualifications shall be in accordance both with the requirements of ASME Section IX and this specification section.

2.2.2.2 Welds deposited by procedures differing from those authorized shall be rejected and completely removed at Seller's cost.

2.2.2.3 At the request of the Buyer, any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.

2.2.3 Acceptable Welding Processes

2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

Welding Process	AWS Letter Designation
Shielded Metal Arc Welding	SMAW
Manual and Automatic Gas Tungsten Arc Welding	GTAW
Automatic Submerged Arc Welding	SAW

2.2.3.2 Other welding processes such as Gas Metal Arc, Manual Submerged Arc and processes employing flux-cored electrodes require specific written authorization by Buyer. Submit all pertinent data and intended application of said process for evaluation.

PART 3 EXECUTION

3.1 **PREPARATION**

3.1.1 Weld joint preparation shall be made by mechanical means or thermal cutting. When thermal cutting is performed, the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel cutting of stainless steel is not acceptable.

3.1.2 Permanent backup strips are not permitted without specific written authorization from Buyer. If temporary backup rings are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the weld surfaces shall be performed visually and by the liquid penetrant or magnetic particle method, whichever is applicable. Liquid penetrant or magnetic particle examination shall be in accordance with Paragraph 3.2.5.

3.1.3 To minimize the contamination of 304L stainless steel Seller shall follow the requirements of Specification Section 13252 prior to and after welding.

3.1.4 For stainless steel the joint edges and adjacent surfaces to be welded shall be wire-brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.

3.1.5 Wire brushes used on stainless steel shall be made of 300 Series austenitic stainless steel. Mechanical cleaning tools such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel only and be visible while tool is in use.

3.1.6 Grinding shall be done in such a method that overheating of stainless steel base and weld metal is minimized. Abrasive disks and abrasive flapper wheels are preferred over grinding disks or continuous-belt grinders.

3.2 **INSTALLATION, APPLICATION AND ERECTION**

3.2.1 All welds shall be made in accordance both with Contract Documents and Seller's fabrication drawings.

3.2.2 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be properly conditioned before continuing the weld. The use of starting and stopping plates is recommended where possible.

3.2.3 Welds shall be free of coarse ripples, grooves, overlap and undercut. Intermittent welds are not permitted because of increased chance of stress corrosion cracking and difficulty in decontamination.

3.2.4 Preheat and Interpass Temperature Control

3.2.4.1 For 304L stainless steel the minimum preheat shall be 50°F. The maximum interpass temperature shall not exceed 350°F.

3.2.4.2 For carbon steel the minimum preheat shall be 50°F.

3.2.5 Inspection and Nondestructive Examination

3.2.5.1 General Requirement

Specific nondestructive examination (NDE) shall be as noted either in Specification Section 13433 or Specification Section 15620. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

3.2.5.2 Inspection

A. All phases of the welding operations from approval of materials through acceptance of welds shall be inspected by Seller's welding inspector.

B. Seller's welding inspector shall be qualified and certified in accordance with AWS QC1 or equivalent QA program authorized by Buyer.

C. All weld inspection reports shall be maintained and submitted in accordance with Paragraph 1.6.7.

3.2.5.3 Visual Examination

A. Visual examination shall be performed in accordance with ASME Code, Section V, Article 9, and this specification section.

B. The welds to be examined, the evaluation of indications and the acceptance criteria shall be in accordance with ASME Code, Section V, Article 9, Paragraphs T-950-1 and T-950-2, and ASME Code Section VIII, Division 1, Paragraph UW-35.

C. Visual examination shall be performed on accessible surface of all completed welds.

D. In addition to visual examination of completed welds, visual examination is required for all ground and blended welds.

E. For butt joints, the weld metal on the front surface shall in no place be lower than the adjacent base metal surfaces.

F. Groove and fillet welds shall have a uniform transition from the base material into the weld deposit. They shall be free of undercut and unfused overlap.

3.2.5.4 Liquid Penetrant Examination

A. Liquid penetrant examination procedures shall be in accordance with the requirements and methods specified in ASME Code, Section V, Article 6.

B. Penetrant materials shall meet the requirements of Paragraph T-625 of Article 6, Section V of ASME Code, for sulfur and halogen content regardless of the type of material to be examined.

C. Liquid penetrant examination of welds shall include a band of base metal at least 1 inch wide on each side of the weld.

D. The evaluation of indications and the acceptance criteria shall be in accordance with ASME Code, Section VIII, Division 1, Appendix 8, Paragraphs 8.3 and 8.4 and Part UHA Paragraph UHA-34.

3.2.5.5 Magnetic Particle Examination

A. Magnetic particle examination procedures shall be in accordance with the requirements and methods specified in ASME Code, Section V, Article 7.

B. Magnetic particle examination of welds shall include a band of base metal at least one inch wide on each side of the weld.

C. The evaluation of indications and the acceptance criteria shall be in accordance with ASME Code, Section VIII, Division 1, Appendix 6, Paragraph 6.4.

3.2.5.6 Radiographic Examination

A. Radiographic examination procedures and techniques shall be in accordance with ASME Section V, Article 2.

B. The acceptance criteria and extent of examination shall be in accordance either with ASME Code, Section VIII, Division 1, Paragraph UHA-33 or UW-51, whichever is applicable.

3.3 **SHOP QUALITY CONTROL**

(Not Used)

3.4 **ADJUSTMENTS**

3.4.1 Weld Repairs

3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedure.

3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall be examined by the liquid penetrant or magnetic particle method to assure complete removal of defects. Liquid penetrant and magnetic particle examination shall be in accordance with Paragraph 3.2.5.

3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected along with all other inspection called out for the particular weld.

3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

ATTACHMENT A

WELD MAP DATA SHEET

Buyer P.O. No. Item No.

Buyer Weld Specification No.

1. Draw a single line sketch of the pressure retaining parts.
2. Identify each qualified welding procedure.

SKETCH

Seller
Address
Buyer PO#

This Form Completed By _____

Telephone No. _____

Revisions _____

Date _____

Buyer Welding Eng. Review Block

WELD PROCEDURE SUMMARY DATA

Space No.	Action to be Taken
1	Enter the Buyer's Purchase Order number. A separate summary must be completed for each P.O. and suborder.
2	Enter the Buyer's item number(s). The summary sheet must reflect all items of similar construction that will have common welding procedures. Items of markedly different materials or methods of Manufacture should be entered on separate WPS's.
3	Enter Seller's name.
4	Enter Seller's shop location where work will be performed.
5	Enter date summary is compiled.
6	Enter Buyer serial number and revision (Buyer's use only).
7	Enter Welding Procedure Specification (WPS) number.
8	Enter Procedure Qualification Record (PQR) number(s) supporting the WPS.
9	Enter the welding process(es) used in performing (PQR).
10	Enter type of joint as referenced in Legend. Where (E) is used, state type of joint or overlay in space 17.
11	Enter ASME-ASTM materials to be used in fabrication.
12	Enter base metal thickness range qualified by PQR.
13	Enter post weld heat treatment information in appropriate box.
14	Enter other pertinent information in this space. Such as impacts, etc.
15	Enter current review status of weld procedure (Buyer's use only).
16	Enter date of current review status of weld procedure (Buyer's use only).
17	Enter any special design or process information regarding the item of construction in this box.

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

Rev. 0

WELDING PROCEDURE SUMMARY

Welding Pressure Vessels

SERIAL NO.	PROCEDURE NO.	SUPPORTING PQR	PROCESS	JOINT TYPE	ASME-ASTM MATERIAL	THICKNESS QUALIFIED	PHWT		COMMENTS	STATUS	DATE
							YES	NO			
6	7	8	9	10	11	12	13		14	15	16

LEGEND

JOINT TYPE DESCRIPTION
- A Longitudinal Seam
- B Circumferential Seam
- C Pipe Seam
- D Nozzle Seam
- E Other (Explain in comments section)

REVIEW TYPE
- A Commence Fabrication
- B Commence Fabrication Submit w/Corrections
- C Do Not Fabricate

REMARKS:

17

SELLER: 3

SHOP LOCATION: 4 DATE: 5

P.O. NO.: 1 ITEM(S): 2

U.S. DEPARTMENT OF ENERGY
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WELDING PROCEDURE SUMMARY

Welding Pressure Vessels

SERIAL NO.	PROCEDURE NO.	SUPPORTING PQR	PROCESS	JOINT TYPE	ASME-ASTM MATERIAL	THICKNESS QUALIFIED	PHWT		COMMENTS	STATUS	DATE
							YES	NO			

LEGEND

JOINT TYPE DESCRIPTION

- A Longitudinal Seam
- B Circumferential Seam
- C Pipe Seam
- D Nozzle Seam
- E Other (Explain in comments section)

REVIEW TYPE

- A Commence Fabrication
- B Commence Fabrication Submit w/Corrections
- C Do Not Fabricate

REMARKS:

SELLER: _____ SHOP LOCATION: _____ DATE: _____

P.O. NO.: _____ ITEM(S): _____

SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS

PART 1 GENERAL

1.1 SUMMARY

This specification section outlines the requirement for handling, fabrication, shipment and storage techniques to minimize the risk of contamination of stainless steel and nickel alloys. Contaminating compounds are those which contain free iron, sulfur, chlorides and low melting-point metals. Typical sources of contamination are listed below.

* carbon steel brushes, chains, hooks etc.
* adhesive/pressure sensitive tapes
* grinding/abrasive disks
* marking material
* lubricants
* nondestructive examination materials
* cleaning fluids
* hydrostatic test water

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publication are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING OF MATERIAL (ASTM)

ASTM A380	1988 Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM D129	1991 Standard Test Method for Sulfur in Petroleum Products (General Bomb Method)
ASTM D808	1991 Standard Test Method of Chlorine in New and Used Petroleum Products (Bomb Method)
ASTM D1552	1990 Standard Test Method for Sulfur in Petroleum Products (High-Temperature Method)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODE

ASME Section V 1989 Nondestructive Examination

1.3 **RELATED REQUIREMENTS**

(Not Used)

1.4 **DEFINITIONS**

COC - Certificate of Compliance

ppm - Parts Per Million

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirement section of the Order/Subcontract.

1.6.1 Seller's procedure for handling, cleaning, isolation and storage of stainless steel and nickel alloys. These procedures shall be submitted for Buyer approval.

1.6.2 Certificate of Compliance shall be submitted for materials that are not intended to be removed after fabrication. Examples of these materials are: lubricants, thread compound, nondestructive examination materials, etc.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **GENERAL MATERIAL REQUIREMENTS**

2.1.1 All limitations specified, e.g., percent, part per million (ppm) etc. are to be by weight.

2.1.2 All consumables and materials used during fabrication shall meet the following general requirements unless addressed in more detail in this specification section:

2.1.2.1 Maximum chloride content shall be 250 ppm.

2.1.2.2 Maximum sulfur content shall be 1 percent.

2.1.2.3 Low melting point elements (such as cadmium, lead, mercury, tin and zinc) shall not be added.

2.1.3 Carbon Steel Contamination

2.1.3.1 Tools and equipment used to cut, form and handle stainless steel and nickel alloys shall be in accordance with one of the following requirements:

A. Tools and equipment shall either be hardened tool steel or chrome-plated steel.

B. Surfaces of non-stainless steel tools and equipment which come into contact with stainless steel shall be covered either with paper, plastic or stainless steel sheet.

2.1.3.2 Grinding equipment and stainless steel wire brushes previously used on carbon steel shall not be used on stainless steel and nickel alloys.

2.1.3.3 Temporary attachments for welding or fabrication shall be of a similar grade material (e.g., 300 series stainless steel shall be used for a temporary attachment to 304L stainless steel) to the pressure component.

2.1.3.4 If scaffolding or ladders are used during fabrication, the contact surfaces at the stainless steel or nickel alloy interface shall be protected either by wood or plastic. No direct contact shall be permitted.

2.1.3.5 Areas used for fabrication of stainless steel and nickel alloys shall be separate from carbon steel fabrication areas. These areas shall be kept free of carbon steel shavings and grinding dust.

2.1.3.6 Where it is not possible to provide protection from carbon steel, the components shall be chemically cleaned to dissolve any carbon steel which may be embedded in the stainless steel or nickel alloy surface. The cleaning requirements shall be in accordance with ASTM A380.

2.1.3.7 Non-metallic slings shall be used when safe to do so. Lifting with carbon steel chains from lifting lugs is acceptable.

2.1.3.8 Carbon steel strapping material used for shipping shall not contact stainless steel or nickel alloy equipment or piping.

2.1.3.9 Surfaces that are found to be contaminated with carbon steel shall be restored. Mechanical descaling is the preferred method. It shall be performed in accordance with ASTM A380.

2.1.3.10 Walking directly upon stainless steel surfaces shall be avoided where possible. Surfaces upon which walking access is required shall be protectively covered.

2.1.4 Wrapping and Protective Covering Materials

2.1.4.1 No chloride restriction shall apply to wrapping and protective covering material (such as polyethylene and polyvinyl chloride (PVC) films) when used for packaging or storage purposes. PVC caps, plugs and packaging material shall not be reused.

2.1.4.2 Pressure-sensitive tapes or adhesive-backed tapes shall not be used within 12 inches of any area where local heating or welding may increase the metal temperature to 180°F or higher.

2.1.4.3 Where tape is used during welding for back purging, the tape shall be of a low-chloride type.

2.1.4.4 After pressure-sensitive and adhesive-backed tapes are no longer required they shall be removed. Any remaining residual adhesive shall be removed. Acetone shall be used.

2.1.5 Grinding Discs, Abrasive Discs, Brushes and Material Removal Tools

2.1.5.1 Grinding discs, abrasive discs and brushes shall be designated for use on stainless steel and nickel base alloys. These materials shall not have been previously used on carbon steel, low alloy steels or nonferrous metals and their alloys.

2.1.5.2 Grinding discs, abrasive discs and belts shall be of resin bonded alumina, silicon carbide or zirconium carbide. Sulfurized compounds shall not be used as a bonding material.

2.1.5.3 Only 300 series stainless steel brushes shall be used on stainless steel and nickel base alloys.

2.1.5.4 All material removal and cleaning tools shall be marked to identify that they are to be used on stainless steel and nickel alloys only. Marking shall be visible while tool is in use.

2.1.6 Nondestructive Examination Materials

2.1.6.1 Sulfur and halogen content of liquid penetrant materials shall be in accordance with the requirements of T-625 of Article 6, Section V of ASME Code.

2.1.7 Cleaning Fluids

Chlorinated hydrocarbon solvents may be used for stainless steel cleaning provided they are analyzed for total residual chlorine and sulfur. The analysis process is as follows:

A. Select and weigh a glass Petri dish of 150mm nominal diameter. Note the weight.

B. Pour a 100 gram sample of the solvent into the Petri dish.

C. Heat the sample for 60 minutes. The heating temperature shall be between 194°F and 212°F, inclusive.

D. Weigh the Petri dish again. Subtract the weight noted in Step A from the new weight. This is the weight of the solvent residue.

1) If the residue is less than 0.005 grams, the solvent is acceptable. No further analysis is required.

2) If the residue weight is 0.005 grams or more, repeat Steps A through C. Test the residue in accordance with ASTM D129 or ASTM D1552 for sulfur content. Test the residue in accordance with ASTM D808 for halogen content.

The residue shall not exceed 1 percent by weight in any case.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Hydrostatic Test Water Quality

The intent of the following guidelines is to minimize the risk of chloride stress corrosion cracking and microbiological influenced corrosion without specifying extensive use of high purity water as a test medium.

2.2.1.1 Water used for testing shall be clean, filtered, chlorinated water. The free residual chlorine content of this water shall not be more than 0.1 ppm. It shall be in accordance with the following water chemistry requirements:

A. pH at 77°F shall be 5.5 to 8.0.

B. Chloride content shall be less than 250 ppm.

C. Fluoride content shall be less than 5 ppm.

D. Sulfide content shall be less than 1 ppm.

E. Total dissolved solids shall be less than 500 ppm.

Potable water which is in accordance with U.S. Public Health Service requirements should satisfy these limits.

The test water shall be analyzed before equipment and pipes are filled. The water's free residual chlorine content shall be determined.

2.2.1.2 Test water and equipment or piping surface temperature shall not exceed 140°F at any time during test or drying operations. If a temperature in excess of 140°F is anticipated, high purity demineralized water or steam condensate (less that 1 ppm chlorides) shall be used.

2.2.1.3 Equipment or piping shall be completely drained and thoroughly dried within 48 hours of testing. Acceptable methods of drying include mopping, wiping or blow drying with cool (less than 140°F) nitrogen.

2.2.1.4 Where complete draining of low point and pockets prior to drying is not possible, the equipment or piping shall be rinsed with high purity demineralized water or steam condensate (less than 1 ppm chlorides). The equipment shall then be blow-dried with cool (less than 140°F) nitrogen. Drying shall be completed within 48 hours of rinsing.

2.2.1.5 When equipment or piping is subjected to an extended hydrostatic test or wet layup condition (greater than 48 hours) the test water shall be analyzed for microbiological contamination. If necessary, the water shall be treated on a daily basis with a biocide to minimize the risk of microbiological contamination. Acceptable biocides include chlorine (0.2 ppm residual) and ozone (0.1 ppm residual).

2.2.1.6 Sensitized (i.e., welded) type 304 or type 316 austenitic stainless steel equipment and piping shall be hydrostatically tested with high purity demineralized water or steam condensate (less than 1 ppm chlorides). Equipment and piping shall be drained and dried in accordance with Paragraph 2.2.1.3 after testing. Test water for equipment or piping subjected to extended hydrostatic

test (greater than 48 hours) shall be treated with biocide in accordance with Paragraph 2.2.1.5.

2.2.1.7 All equipment and piping shall be sealed and maintained in clean condition once testing is complete.

2.2.1.8 Any hydrostatic test condition or procedure not addressed by the above paragraphs shall be submitted to Buyer for review prior to the start of testing.

2.2.2 Cleaning Requirements

All surfaces to be welded shall be free of paint, oil, grease, dirt and other foreign materials detrimental to the weld soundness. An area 4 inches wide on each side of weld joint shall be cleaned. Acceptable cleaning methods shall be mechanical or chemical methods in accordance with ASTM A380.

2.2.3 Application

2.2.3.1 After welding all foreign material such as flux, anti-spatter compound, slag and spatter shall be removed. Removal can be accomplished either by mechanical or chemical methods.

2.2.3.2 Heat tint and scale shall be permitted on nonprocess side of weld joint. When required, heat tint and scale can be removed either by mechanical or chemical descaling methods. For mechanical descaling, precleaning and post-cleaning is required.

2.2.3.3 Liquid penetrant and ultrasonic examination materials shall be completely removed from surface after examination. Solvents used to remove examination materials shall be in accordance with Paragraph 2.1.7.

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 13433
PRESSURE VESSELS - STAINLESS STEEL

PART 1 GENERAL

1.1 SUMMARY

This specification section covers minimum requirements for the design, fabrication, inspection and testing of stainless steel vessels and appurtenances.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5	1988 Pipe Flanges and Flanged Fittings
ANSI Y14.5M	1982 Dimensioning and Tolerancing

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

ASTM A380	1988 Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM A480/A480M	1991 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODES

ASME Section II, Part A	1989 Material Specifications-Ferrous Materials (Addenda 1990)
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

UNIFORM BUILDING CODE (UBC)

UBC	1988 Uniform Building Code

1.3 **RELATED REQUIREMENTS**

Specification Section 05063	Welding Pressure Vessels
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Drawings	See Attachment D

1.4 **DEFINITIONS**

CMTR - Certified Material Test Report

COC - Certificate of Conformance

DP - Design Pressure

MAWP - Maximum Allowable Working Pressure

NDE - Nondestructive Examination

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Shop Drawings

A. Dimensional details with applicable tolerances in accordance with ANSI Y14.5M.

B. Detailed bill of materials.

C. General arrangement, assembly or outline drawings. These drawings shall include the following information:

1) ASME code edition and addenda.

2) Coincident design pressure and temperature to be stamped on the nameplate.

3) Hydrostatic test pressure in psig.

4) Basis for the calculated test pressure and the limiting part.

5) The vessel nameplate and all its markings.

6) Corrosion allowance and location.

7) Welded joint efficiency.

8) Vessel name and equipment number.

9) Standards, specifications and welding procedures.

10) Listing of additional drawings.

11) Requirements for nondestructive examination (NDE).

12) Details of weld preparations and location of all circumferential and longitudinal weld seams.

13) Cleaning, surface preparation and labeling requirements.

14) Total fabricated weight of vessels, in pounds (round up to 3 significant figures or to hundreds of pounds).

15) Vessel's center of gravity.

D. Vessel elevation. This elevation shall indicate shell thickness, head thickness, shell-to-head transition and vessel supports.

E. Lifting lug calculations and lifting lug reinforcement to vessels.

F. Details of internal appurtenances, weld details, reinforcements, dimensions, finishes and applicable tolerances.

G. Details for parts. These shall show the following additional information:

1) Material of construction. This shall include nominal and finished minimum thicknesses.

2) Details of all weld joint preparation, applicable weld procedure number and NDE requirements.

1.6.2 ASME Code Documents and Special Requirements

Documents submitted to Buyer pertaining to ASME code certification, material and quality control records shall include the following:

A. Hydrostatic test pressure chart for each vessel.

B. Photograph of the actual nameplate for each vessel.

C. Pressure vessel material record which shall be completed for each vessel (refer to Attachment A). This record shall include:

1) An outline sketch of the vessel or an equivalent method of identification. This shall show the location of the principal pressure-retaining parts (shells and heads).

2) The primary material record for all pressure retaining parts made from plate, any nonpressure part required to be made from same plate material as the shell, seamless pipe used as a shell or sump and any pressure-retaining part whose material specification does not provide for the marking of each mill product piece [see ASME Code, Section VIII, Division 1, Paragraph UG-93(a)(3)].

3) The miscellaneous material record. This shall list the complete material specification designation when the material specification of a pressure-retaining part provides for the marking of each piece [see ASME Code, Section VIII, Division 1, Paragraph UG-93(a)(2)] and for all nonpressure retaining parts not listed in the primary material records.

4) The "pressure vessel material record" (Attachment A) form shall be signed by an authorized representative of the vessel manufacturer's quality control department.

D. Seller shall include two copies of the records of inspections and tests performed by Seller with each shipment of article(s). These shall include records of the results of each inspection and test performed.

E. Certified Material Test Reports (CMTRs) shall be submitted in accordance with Paragraph 2.1.2.I.

1.6.3 Design Calculations

Seller shall be responsible for the complete design of the pressure vessel. Seller shall submit appropriate calculations that demonstrate the adequacy of the design to resist the design loadings specified in Paragraph 2.1.3 in accordance both with ASME Code, Section VIII, Division 1 and the additional requirements of this specification section.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 General

Pressure vessels described in this specification section and as shown on drawings listed in Attachment D shall be completely shop-manufactured. Each item shall be designed, fabricated, inspected, tested and certified in accordance both with the ASME Code, Section VIII, Division 1 and the additional requirements of this specification section.

2.1.2 Materials

A. All materials shall be of the material specification, grade and condition in accordance with the Contract Drawings listed in Attachment D. All pressure-retaining materials shall be in accordance with ASME Code, Section II, unless otherwise specified.

B. All stainless steel materials shall be fully annealed in accordance with ASME Code, Section II, Part A, Material Specification.

C. Stainless steel plate material shall be Number 1 finish with a hot-rolled, annealed, pickled and surface-cleaned finish in accordance with ASTM A480/A480M. Other forms of material shall have similar form of finish.

D. Material shall be ordered with all surfaces in the iron-free condition. This condition shall be maintained throughout

all phases of fabrication. The recommendation of Section 8 of ASTM A380 shall be followed for the prevention of contamination.

E. No substitution of materials shall be permitted.

F. No welding repair of material defects shall be made without Buyer's approval in each specific case.

G. Nozzle necks that are fabricated from plate shall be the same material specification and grade as the vessel shell or head to which they are attached.

H. Materials for external supports and clips welded directly to shell or head shall be the same type as specified for the vessel part to which they are attached.

I. Certified Material Test Reports (CMTRs) shall be provided for all plate, sheet, piping, tubing, flanges and fittings that come into contact with the process liquid. Exception: items of standard manufacture shall require a manufacturer's Certificate of Conformance (COC). This shall identify the materials of construction. Materials for which test reports are required shall bear the manufacturer's markings which uniquely correlate them with the test reports.

J. If fabrication requires that the original identification markings be removed or if the material is divided into two or more parts, one of the following identification procedures shall be effected. This is to assure identification of all materials both during fabrication and on the as-built drawings.

1) One set of markings shall be accurately transferred to another location on the material.

2) A coded marking shall be placed on the material.

2.1.3 Design

2.1.3.1 General

A. Coincident design pressure and temperature shall be in accordance with the Contract Drawings. This will be the design pressure and temperature stamped on the vessel nameplate. Maximum Allowable Working Pressure (MAWP) shall be equal to Design Pressure (DP).

B. Shop hydrostatic test pressure shall be 1.5 times MAWP.

C. The material thicknesses specified on the Contract Drawings for the equipment item number are minimum nominal dimensions including corrosion allowance. These are based on design analysis. The analysis considers all loadings to which the pressure vessel is expected to be subjected. Under no circumstances shall any specified material thickness be reduced. Additional material must be added to the specified thickness of any component subject to thinning due to forming.

D. Corrosion allowance for vessel shell, heads and nozzle necks shall be in accordance with the Contract Drawings. Corrosion allowance for nonremovable internal parts shall be the same as the vessel applied to all exposed surfaces. The minimum corroded thickness shall be no less than 1/8 inch.

E. All internal and external attachments shall either be full-penetration welded or completely seal-welded. All details shall allow for complete drainage without pockets. Reinforcing pads shall have tapped holes plugged and seal-welded prior to shipment after all required testing has been completed.

F. The vessel lifting lugs shall be designed for a load that is 150 percent of the dry weight of the total assembled unit. Calculations shall be submitted to the Buyer for approval prior to lifting lug fabrication.

2.1.3.2 Connections

A. The number, sizes, location and material shall be in accordance with the Contract Drawings.

B. Nozzle flanges shall be in accordance with ANSI B16.5. Nozzle mark item number as shown on the Contract Drawings shall be stenciled at the side of all the flanges.

C. The bore of nozzle necks, attachment pipe and flanges shall match or be tapered to match in accordance with ASME Code, Section VIII, Division 1. The minimum thickness after tapering shall be not less than that required by the ASME Code, Section VIII, Division 1.

D. Nozzle attachment welds, ASME Code, Section VIII, Division 1, Paragraph UW-3, Categories "B" and "D," shall be full-penetration welds through the thickness.

E. The finish of the gasket contact surface of flange facings shall be in accordance with ANSI B16.5 unless otherwise shown on Contract Drawings.

F. The minimum neck thickness for manholes and inspection openings shall be in accordance with ASME Code, Section VIII, Division 1 requirements for nozzles.

G. Flange bolt hole orientation shall be in accordance with Attachment B of this specification section.

2.1.3.3 Seismic Design

Seismic design shall be in accordance with the provision of the Uniform Building Code (UBC-1988) for nonstructural components supported by structures (Section 2312g) for UBC Zone 2b. The static horizontal seismic force (F_p) applied at the center of gravity in the direction under consideration shall be determined from the following equation:

$$F_p = ZIC_pW_p$$

where: $I = 1.25$
$C_p = .75$ For vessels (including contents) ("T" less than 0.06 sec)
$C_p = 1.5$ ("T" greater than 0.06 sec)
W_p = weight of item being considered
$Z = 0.20$

Consideration shall be made for the effects of vessel content sloshing during a seismic event.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General

A. Cleaning of stainless steel and its handling during fabrication shall be in accordance with Specification Section 13252.

B. Longitudinal welded joints shall not be located behind any plate or obstruction which prevents inspection of the weld. Circumferential welded joints shall clear internal support rings or other attachment welds by not less than 1 inch.

C. The vessel nameplate shall be austenitic stainless steel. It shall be not less than 1/8 inch thick. The background shall be etched 0.01 inch. The nameplate shall be welded to a bracket which in turn is welded to the vessel. The bracket shall extend 2 inches beyond the outside of the vessel or insulation. The nameplate shall include the following information:

1) Manufacturer's name and location (city)

2) Manufacturer's serial number _____

3) Date built (month and year)

4) Maximum allowable working pressure _____psig _____°F (coincident pressures and temperatures)

5) Minimum design metal temperature

6) Vessel equipment number _____

7) Vessel name _____

8) Vessel fabricated weight _____ pounds (round up to 3 significant digits or to hundreds)

9) Project control number _____

D. Each vessel shall be provided with two lifting lugs.

2.2.2 Welding

A. Shell and head joints shall be full-penetration, double butt-welded joints.

B. Nozzles shall be welded to the shell and heads with full-penetration groove welds unless specified on the Contract Drawing.

C. Welding shall be in accordance with Specification Section 05063.

2.2.3 Heat Treatment

A. When Seller elects to perform heat treatment or heat the material for forming above lower transformation temperature, the following procedures and records shall be submitted for approval.

1) Heating temperature/time

2) Holding temperature/time

3) Cooling rate and temperature

B. Additional welding on vessels which have been postweld heat treated shall not be permitted.

C. Heating in the range of 800°F to 1600°F shall be avoided.

2.2.4 Tolerances

Manufacturing tolerances shall be as shown in Attachment C of this specification section and in accordance with ASME Code, Section VIII, Division 1 unless specified on the Contract Drawings.

2.2.5 Inspection and Tests

2.2.5.1 Nondestructive Examination

A. Nondestructive examination methods (NDE) and acceptance shall be in accordance with Specification Section 05063.

B. The specific requirements for nondestructive examination shall be as shown by NDE symbols on Seller's drawings.

C. When liquid penetrant inspection is specified, machining or grinding of the surface will not be allowed other than to remove excessive irregularities which would interfere with proper interpretation of results.

2.2.5.2 Pressure Tests

A. All vessels shall be hydrostatically tested at the hydrotest pressure specified on the Contract Drawings. The hydrotest procedure shall be in accordance with ASME Code, Section VIII, Division 1, Paragraph UG-99(b). Test pressure shall be held for not less than one hour.

B. Seller shall submit detailed pressure testing procedures for each vessel. These shall include the fluid to be used and method of determining its temperature and test pressure. No vessel shall be closed for pressure testing without Buyer's approval.

C. Additional welding on the vessel shall not be permitted after hydrostatic tests have been completed.

2.2.5.3 Shop Inspection

A. Shop inspections of each pressure vessel shall be made by Seller. Seller inspection personnel shall be qualified in accordance with Paragraph UG-91(a) of the ASME code. The references to the inspector in Paragraph UG-90 of the ASME code shall also apply to Seller.

B. The alternative inspections in accordance with Paragraph UG-90(c-2) shall not be permitted.

2.2.5.4 Labeling

A. Electro-etching or vegetable dyes shall be used to provide identification marking of materials and parts in accordance with ASME Code, Section VIII, Division 1, Section II, Part A, Material Specifications. Do not use marking inks or crayons that contain more than 35 ppm of halogens or traces more than 5 ppm of harmful metal or salts such as zinc, lead, molybdenum or vanadium oxides. These may cause corrosive attack when the vessel part is heated. A certified statement from the marking ink manufacturer that these chemical content limits have been met will be considered acceptable.

B. Vessels shall be clearly identified by dye stenciling the equipment name and equipment number in accordance with the Contract Drawing.

C. The center of gravity shall be marked on all vertical vessels. The letters "C.G." and shipping weights in tons (or tenths of tons, e.g., 1.8 tons) shall be painted at two locations diametrically opposite and adjacent to the "C.G." markings.

D. The dye stencil marking and lettering shall be white.

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
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FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457
Rev. 0

ATTACHMENT A
PRESSURE VESSEL MATERIAL RECORD

P.O. NUMBER _____
EQUIPMENT NUMBER _____

1.0 PRESSURE VESSEL SKETCH (PROVIDE ATTACHMENT)

2.0 PRIMARY MATERIAL RECORD

The following components shall be tabulated below:

(a) PRESSURE COMPONENTS: Shell courses, conical reducing sections, heads, rolled plate nozzle necks, nozzle reinforcing pads.

(b) NONPRESSURE COMPONENTS: All items which are required to be the same material specification as shell courses and heads.

ITEM	DESCRIPTION	MATERIAL	MANUFACTURER	HEAT NO.	SLAB NO.

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ATTACHMENT A
PRESSURE VESSEL MATERIAL RECORD (Continued)

P.O. NUMBER _____
EQUIPMENT NUMBER _____

3.0 MATERIAL TEST REPORTS

Provide a reproducible copy of Certified Material Test Report for only those components tabulated in the primary material record.

4.0 MISCELLANEOUS MATERIALS

Flanges:	Structural Shapes:
Blind Flanges:	Other:
Nozzle Pipe Necks:	_____
Internal Piping:	_____
Support Skirt/Saddle:	_____
Wear Plate:	_____
Welded Internal Supports:	_____
Welded External Attachments:	_____
Bolting (Internal):	_____
Bolting (External):	_____

We certify that the materials as listed in this document were used in the construction of the subject pressure vessel.

SIGNED _____ DATE _____

TITLE _____

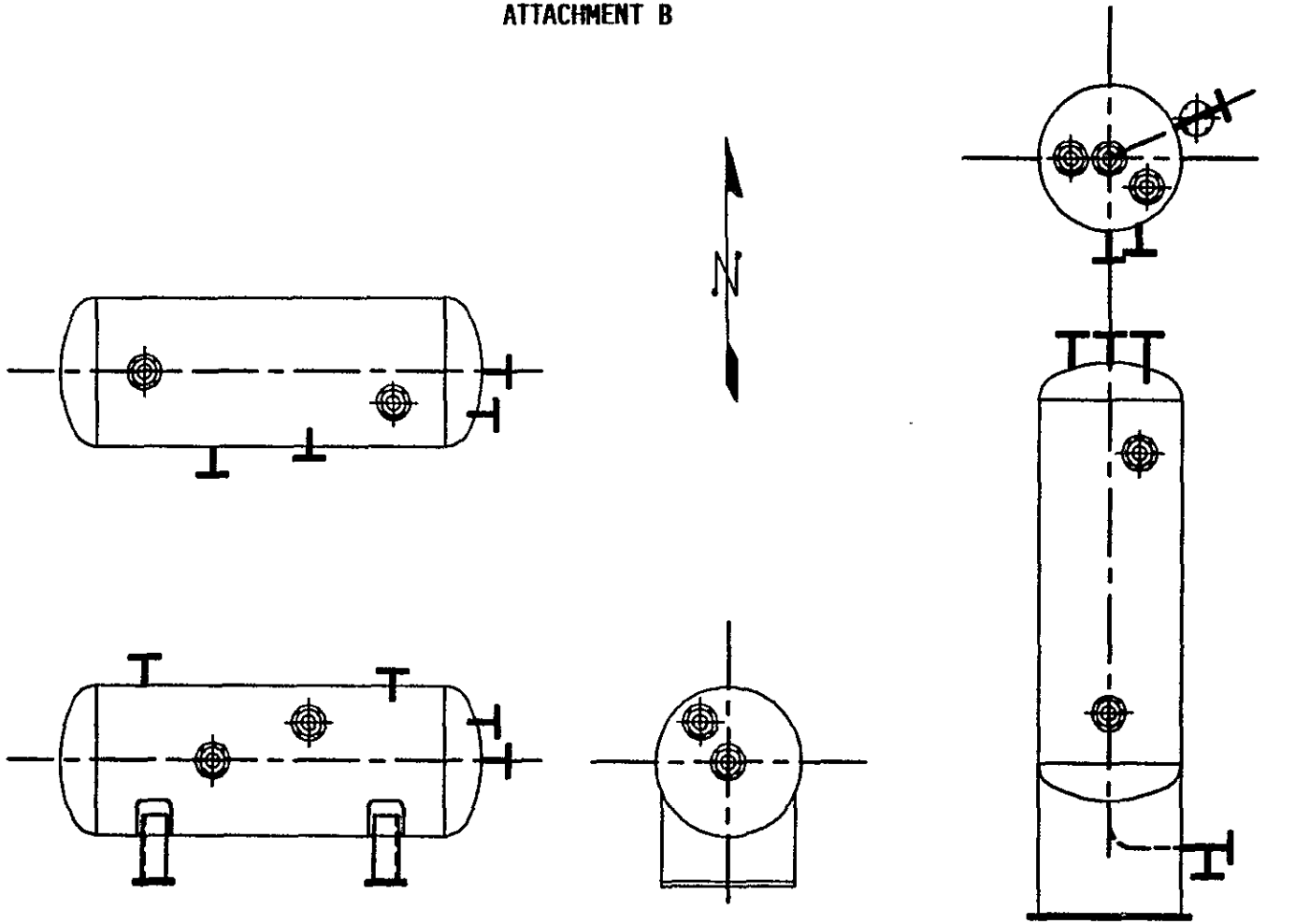
SELLER _____

_____

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457
Rev. 0

ATTACHMENT B



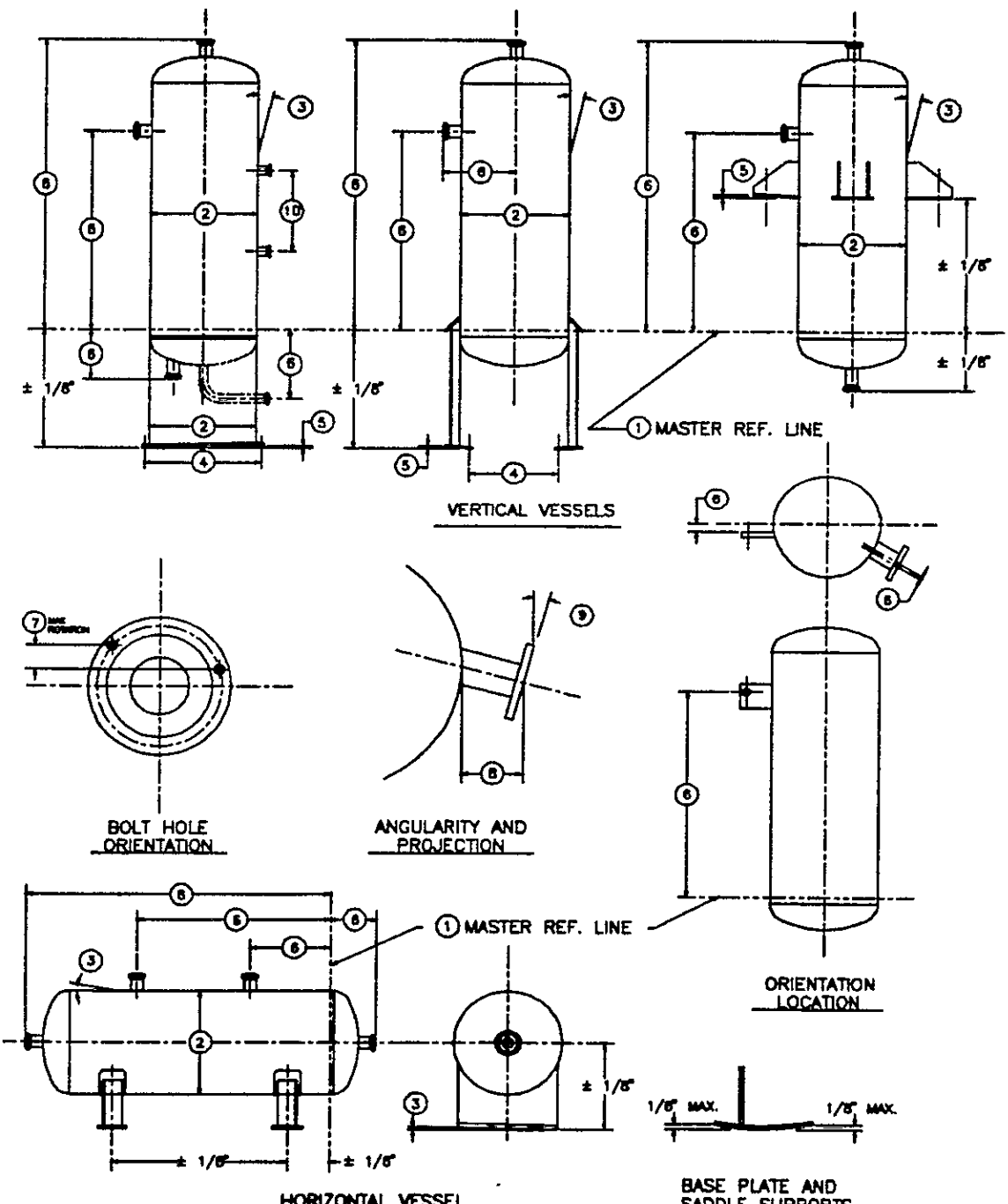
HORIZONTAL VESSEL

VERTICAL VESSEL

FLANGE BOLT HOLE ORIENTATION

ATTACHMENT C

VESSEL TOLERANCES



ATTACHMENT C

The following notes are referenced to the numbered circles of Attachment C:

① The master reference line shall be established by the vessel manufacturer and clearly marked inside and outside of the shell prior to attaching the adjacent head. It shall be parallel to the root land of the shell course and perpendicular to the longitudinal axis of the vessel.

② Shell and Skirt Outside Circumference Tolerance:

OUTSIDE DIAMETER	SHELL OR SKIRT THICKNESS UP TO 2-1/2"	2-1/2" TO 4"	OVER 4"
LESS THAN 4'-0"	± 3/8"	± 1/2"	
OVER 4'-0" TO 8'-0"	± 1/2"	± 3/4"	± 1"
OVER 8'-0" TO 15'-0"	± 3/4"	± 1"	± 1-1/2"
OVER 15'-0"	± 1"	± 1-1/2"	

NOTE:

MATCHING SHELL AND HEAD SHALL BE SUBJECT TO CODE OFFSET TOLERANCE

③ Shell and Skirt Tolerance: Max. slope from straight line is 1/8" in 10'-0" with total max. deviations as follows:

TAN. TO TAN. LENGTH	TOTAL MAX. DEVIATION
UP TO 50' TO 100'-0"	1/2"
50'-0" TO 100'-0"	3/4"
100'-0" AND OVER	1"

④ The center of anchor bolt hole or pipe guide shall not deviate from the specified location on the bolt circle by more than the following:

VESSEL I.D.	MAX. DEVIATION
4'-0 AND LESS	1/8"
OVER 4'-0" TO 8'-0"	3/16"
OVER 8'-0"	1/4"

⑤ Out of level slopes = 1/32" per foot with 1/4" max.

	⑥	⑦	⑧	⑨
NOZZLES	± 1/4"	± 1/16"	± 3/16"	1/2°
COUPLINGS	± 1/4"	----	----	----
MANHOLE HANDHOLES	± 1/2"	± 1/2"	± 1/2"	1°
CLIPS	± 1/4"	----	----	----

⑩ Max. deviation between any (2) coupled instrument connections = 1/16"

ATTACHMENT D

LIST OF CONTRACT DRAWINGS

Drawing H-2-120160	TK-430-002 Process Condensate Collection Tank
Drawing H-2-120195 Sheets 1 and 2	TK-430-001 Demineralized Water Storage Tank

SECTION 15620
ELECTRIC STEAM GENERATOR

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the minimum technical requirements for design, fabrication and testing of the electric steam generator and the blowdown tank. This generator will be installed in the Hanford Waste Vitrification Plant in Richland, Washington.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5	1988 Pipe Flanges and Flanged Fittings
ANSI/ASME B31.1	1989 Power Piping

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODES

ASME Section I	1989 Rules for Construction of Power Boilers (Addenda 1991)
ASME Section I, Part PEB	1989 Requirements for Electric Boilers
ASME Section II, Part A	1989 Material Specifications-Ferrous Materials (Addenda 1990)
SA516/SA516M	Specification for Pressure Vessel Plates, Carbon Steel, for Moderate and Lower Temperature Service
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

AMERICAN WELDING SOCIETY, INC (AWS)

AWS D1.1	1990 Structural Welding Code Steel, Twelfth Edition

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20	1981 Specification Forms for Process Measurements and Control Instruments Primary Elements and Control Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electric Code (NEC)

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 05063	Welding Pressure Vessels
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 13433	Pressure Vessels - Stainless Steel
Specification Section 16610	Electrical Requirements for Electric Steam Generator
Specification Section 17870	Electric Steam Generator System Control Panel
Specification Section 17871	Instruments Furnished with Mechanical Equipment, Electric Steam Generator System
Specification Section 17871A	Safety Class Relief Valves Furnished with Electric Steam Generator (Safety Class 1)

1.4 DEFINITIONS

DP - Design Pressure

FAT - Factory Acceptance Test

MAWP - Maximum Allowable Working Pressure

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Steam Generator System Drawings

1.6.1.1 Seller shall provide the following:

A. Certified dimensional outline drawings. These drawings shall include dimensions, shipping weights, operating weights, center of gravity and clearances to be maintained. They shall also show design temperatures and pressures, operating temperatures and pressures, size and location of all connections, lifting supports, material of construction and corrosion allowances. Drawings shall include the base frames, support skirts, base plate thickness at the foundation bolts, locations of anchor bolt and size of control panel fasteners.

B. Sectional drawings. These drawings shall show inside arrangement construction and details for each component.

C. Steam Generator and Blowdown Tank drawings. These drawings shall include the allowable load on the nozzles and the hydrostatic test pressure (expressed in psig). They shall also show the nameplate and its marking, corrosion allowance and location, welded joint efficiency, weld joint preparation, applicable weld procedure and nondestructive examination (NDE) requirements.

All drawings shall include a detailed bill of materials. This bill shall list the manufacturer, type and ratings of all component parts or assemblies.

1.6.1.2 Electrical Connection Diagrams

Electrical connection diagrams shall be provided. They shall depict all external electrical connections provided by Seller. Diagrams shall include all connections, schematics, interfaces, wire specifications and wiring specified by Seller. The ratings (expressed in KVA) for the fully-installed electric steam generator shall be included.

1.6.1.3 Seller shall provide factory-certified test reports. These shall be in accordance with ASME Section I, Part PEB, Pressure Test Procedures. At minimum, these reports shall include the requirements of Paragraph 2.2.5.2.

1.6.2 Technical Data

1.6.2.1 Design Calculations

Seller shall provide engineering design analysis with supporting calculations, stamped by a Professional Engineer. The analysis shall be used to establish the output of the steam generator and its electrical demand load. Calculations shall be complete and in sufficient detail to permit second party review.

1.6.2.2 Descriptive Literature. This shall include equipment ratings, operating characteristics and technical descriptions.

1.6.2.3 Data Sheet

Seller shall submit completed data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheet DS-1 Sheets 1 and 2 and DS-2 (Attachment A).

1.6.2.4 Steam Generator Performance Curves

Steam Generator performance curves shall be provided. Performance curves shall include steam output, electric energy absorbed, thermal efficiency, time needed to reach full load from a cold start, feed water quality required and boiler water characteristics to be maintained during operation.

1.6.2.5 Certified test reports shall be submitted indicating Factory Acceptance Tests (FATs) as illustrated in Paragraph 2.2.5.

1.6.2.6 ISA S20 Data Sheets shall be completed and submitted for all furnished instruments.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.4 Installation, Operation, and Maintenance Manuals

Installation, operation, and maintenance manuals shall be submitted in accordance with Specification Section 01730. These manuals shall include but not be limited to the following:

1.6.4.1 Fully detailed sequences of disassembly, repair, adjustment, reassembly and troubleshooting.

1.6.4.2 Troubleshooting sections. These shall include fault trees to guide both mechanical and electrical diagnostics.

1.6.4.3 Reduced-size copies of those assembly drawings, subassembly drawings and parts lists needed for routine maintenance and overhaul.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic or Site Environmental Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
(1)	Maximum Design Temperature	110°F
(2)	Minimum Design Temperature	-20°F
(3)	Wet Bulb Design Temperature	68°F

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

A. The steam generator furnished in accordance with this specification shall be of the electrode-heater type (ACMETHERM Model CEJS-900 or equal). It shall use electrical energy to boil water and produce steam. Water flow shall be controlled by a series of jets. This allows regulation of the steam output. The materials used for steam generator construction shall be carbon steel in accordance with ASME Section II Part A A-SA516/SA516M.

The steam generator shall be designed, constructed, tested and stamped in accordance with the ASME Codes; Section I - Power Boilers, Section II - Material Specification and Section VIII - Pressure Vessels, Division 1. The steam

generator capacity and characteristics shall be in accordance with Data Sheet DS-1 Sheets 1 and 2 (Attachment A).

B. A blowdown tank shall be supplied for the steam generator. This blowdown tank shall be in accordance with DS-2 (Attachment A). It shall be designed in accordance both with ASME Section VIII, Division 1 and Specification Section 13433. Tank material shall be Type 304L stainless steel in accordance with ASME Section II A-SA240.

C. The steam generator shall be supplied with a standby heater. This heater shall be designed to keep the steam generator just below the minimum operating pressure of 155 psig during those periods where steam production is shut down or not required. The standby heater shall be of the immersion type.

2.1.1 Support Frame

The blowdown drum shall be furnished complete with a base frame to support it in its location. The base frame shall have as a minimum, three angle (L 3-1/2 by 3-1/2 x 1/2) support legs, 1/2 inch thick base plate for each support leg, and two 15/16 inch diameter anchor bolt holes for each base plate. Each support leg shall be fully welded to both the drum and the base plate. Seller may submit alternate design of equivalent structural integrity for approval by Buyer.

The steam generator shall be furnished complete with a skirt to support it. The skirt shall have a minimum thickness of 1/2 inch, 3/4 inch base plate, and provisions for anchorage with 16-1-1/2 inch diameter anchor bolts and a bolt circle diameter of 6 feet, 6 inches. Holes for anchor bolts shall be 1-13/16 inch diameter. Seller may submit alternate designs for approval by Buyer.

A protective cage shall be built around the high-voltage electrode. This cage shall be constructed by welding in accordance with AWS D1.1. It shall have a lockable access to the high-voltage assembly zone and shall be mounted with bolts to allow removal.

2.1.2 Design Envelope

The maximum equipment envelope is:

A) For the steam generator

Length - 8 feet, 0 inches
Width - 8 feet, 0 inches
Height - 28 feet, 0 inches

B) For the blowdown drum

Length - 5 feet, 0 inches
Width - 5 feet, 0 inches
Height - 10 feet, 0 inches

2.2 FABRICATION AND MANUFACTURE

2.2.1 A. Design pressure and temperature shall be in accordance with Data Sheet DS-1 Sheets 1 and 2 (Attachment A) for the steam generator. Design pressure and temperature shall be in accordance with Data Sheet DS-2 (Attachment A) for the blowdown tank. These will be the design pressures and temperatures stamped on the appropriate nameplates. Maximum allowable working design pressure (MAWP) is equal to design pressure (DP).

B. Shop hydrostatic test pressure shall be 1.5 times MAWP.

C. The material thickness specified shall include a corrosion allowance of 3/16 inch. For nonremovable internal parts corrosion allowance shall be the same as the boiler exposed surfaces.

D. All internal and external pressure-containing attachments shall be full penetration or completely seal-welded in accordance with Specification Section 05063. All structural welding shall be in accordance with AWS D1.1.

E. The boiler lifting lugs shall be designed for a load that is 150 percent of the dry weight of the total assembled unit. Calculations shall be submitted for approval prior to lifting lug fabrication.

2.2.2 Connections

A. Nozzle flanges shall be in accordance with ANSI B16.5. They shall be rated class 300 to interface with 304L type stainless steel piping.

B. All steam generator trim shall be in accordance both with the ASME Code and any supplemental requirements specified herein. This includes (but is not limited to) steam stop valves, feedwater stop, check valves, blowoff valves, safety relief valves, water level indicators, water columns, pressure gauges, associated piping and fittings located within the jurisdictional limits of the code. Material selection and pressure ratings for all valves and piping shall be in accordance both with ANSI B16.5 and the ASME Code. These selections and ratings shall be based on the MAWP of 200 psig specified on Data Sheets DS-1 and DS-2, unless otherwise stated in the ASME Code.

C. All steam generator pipe components shall be in accordance with ANSI/ASME B31.1.

2.2.3 Electrical

The electrical components, materials and installation shall be in accordance both with Specification Section 16610 and NFPA 70. Control panels shall be in accordance with Specification Section 17870.

2.2.4 Steam Generator Instrumentation

All instruments supplied with the steam generator shall be in accordance with Specification Sections 17870, 17871 and 17871A as applicable.

2.2.5 Inspection and Factory Acceptance Tests (FATs)

2.2.5.1 Nondestructive Examination

A. Nondestructive examination methods and acceptance shall be in accordance with Specification Section 05063.

B. The specific requirements for nondestructive examination shall be as shown on Seller's drawings.

2.2.5.2 Pressure Tests

A. The steam generator and the blowdown tank shall be hydrostatically tested at the pressure listed in Paragraph 2.2.1B. The hydrotest procedure shall be in accordance with the ASME Code, Section VIII, Division 1, Paragraph UG-99(b). Test pressure shall be held for no less than one hour.

B. Prior to any leak testing both the steam generator and blowdown tank shall be wiped clean of loose rust particles, scale, chips, grease, and other foreign matter. The inside of both the steam generator and the blowdown tank shall be blown clean with oil-free compressed air. All cleaning shall be in accordance with Seller's approved cleaning procedures.

C. The test medium for steam generator hydrostatic testing shall be potable water in accordance with U.S Public Health Service requirements. The test medium for blowdown drum hydrostatic testing shall be in accordance with Specification Section 13252.

D. Additional welding either on the steam generator or blowdown tank shall not be permitted after hydrostatic testing.

E. The steam generator and blowdown tank shall be thoroughly drained and dried after hydrostatic testing.

2.2.6 Shop Inspection

The alternative inspection in accordance with Paragraph UG-90(c-2) of the ASME Code shall not be permitted.

2.3 **LABELING**

The steam generator and the blowdown tank shall be supplied with a permanently-affixed tag. The tag material shall be stainless steel. It shall contain the equipment service name as shown on the attached Data Sheets. This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be made of corrosion-resistant metal. It shall be permanently attached to the equipment with stainless steel screws. It shall contain not less than the following information expressed in specified units:

Manufacturer's name
Equipment serial number
Equipment size and type
Equipment rated capacity
Maximum allowable working pressure

2.4 **PACKAGING**

Packaging and preparation for shipment shall be in accordance with Seller's standards. At minimum, protection shall be provided against corrosion and damage during normal handling, shipping and

storage. Minimum preparation shall include the requirements listed below.

2.4.1 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.4.2 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with a minimum of four (4) full diameter steel bolts and nuts.

2.4.3 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.4 Equipment Assemblies shall be shipped fully assembled on their baseplate.

2.4.5 The Controllers shall be shipped separately. They shall be field wired to the equipment from the remote location.

2.4.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.7 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ELECTRIC PROCESS STEAM GENERATOR

NO	BY DATE	REVISION
01	11/20/90 KM/SSL	
02	06/18/91 MD/MF	

SHEET NO. DS1-SH 1 OF 2	REV. 00
DATE 02-26-90	CONTRACT 845724
TAG NO. GS-430-001V	
SPECIFICATION SECT NO. 15620	
FOR CLIENT USE	
ORIG WR / CHK'D / APPR'D	

Client DOE
Service ELECTRIC PROCESS STEAM GENERATOR
Design Duty 26.47 X 10 6 Btu / Hr
Transfer Rate Service
Total Surface (Eff) Ft²

Vendor
Plant HWVP
Size
Clean Btu / Hr Ft ² • F Mid. (Eff.) •F
Shells / Unit Surface / Shell (Eff) Ft²

PERFORMANCE OF ONE UNIT

		SHELL SIDE		TUBE SIDE	
FLUID NAME		PROCESS STEAM / CONDENSATE		TOWER WATER	
Total Flow	Lbs / Hr	24,000			
		INLET	OUTLET	INLET	OUTLET
LIQUID	Lbs / Hr				
Molecular Weight					
Specific Gravity	$				
Thermal Cond.	Btu / Hr Ft² •F / Ft				
Specific Heat	Btu / Lb •F				
Viscosity	Cp				
Surface Tension	Dyne / Cm				
Bubble Point	•F				
VAPOR	Lbs / Hr				
Molecular Weight					
Density	Lb / Ft³				
Thermal Cond.	Btu / Hr Ft² • F / Ft				
Specific Heat	Btu / Lb • F				
Viscosity	Cp				
Latent Heat	Btu / Lb				
Dew Point	•F				
Non - Condensables	Lbs / Hr				
Molecular Weight					
Steam	Lbs / Hr		24,000		
Water	Lbs / Hr	24,000			
Temperature	•F	125	368		
Pressure (Atmos 14.3 Psia)	Psig	165	155		
Pressure Drop	Psi	ALLOW.: 5	CALC.:	ALLOW.:	CALC.:
Velocity	Ft / Sec				
Fouling Resistance	Hr Ft² • F / Btu	0.0005			
Additional Data on Sheet No.					

REMARKS:

SAFETY CLASSIFICATION 3
IMPACT LEVEL 3

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ELECTRIC PROCESS STEAM GENERATOR

NO	BY / DATE	REVISION
01	11/20/90 KM/SSL	
02	06/18/91 MD/MF	

SHEET NO. DS1-SH 2 OF 2 | REV. 00
DATE 02-06-89 | CONTRACT 845724
TAG NO. GS-430-001V
SPECIFICATION SECT NO. 15620
FOR CLIENT USE
ORIG WR | CHK'D | APPR'D

		SHELL SIDE	TUBE SIDE
Design Pressure	Psig	195 & FULL VACUUM (1)	
Test Pressure	Psi		
Design Temperature	°F	400	
Corrosion Allowance	in.		
Number of Passes			
Diff Des Pressure	Psig		
Flow Arrangement		Parallel N/A / Series N/A	Parallel / Series

CONSTRUCTION

Shell Dia (ID) (OD)	in.	Baffle Type		Wt Bundle & Shell	Lbs.
No. Tubes / Shell		No ° Spacing	in.	Wt Bundle	Lbs.
OD ° Length	in.	Segmental Cut	% Dia.	Wt Full of Water	Lbs.
Gauge Bwg (min.)	in.	Impingement Baffle		RHO V^2 Inlet Nozzle	
Tube Pitch	Deg.	Expansion Joint		RHO V^2 Bundle Entr	
Tema Class		Exp Joint Des Temp		RHO V^2 Bundle Exit	
Code Req ASME		Surface Prep		Specifications	
Code Stamp	(YES)	Paint			
Removable Tube Bundle		Insulation	(YES)	Lethal Service Stamp	

MATERIALS (MARK STRESS RELIEVED - SR, RADIOGRAPHED - XR)

Tubes	Shell	C.S. W/3/16" C.A.
Tubesheet	Shell Cover	
Baffles / Tubesupports	Shell Flange	
Tie Rods and Spacers	Channel / Bonnet	
Long Baffle	Channel Cover	
Gasket Shell Side	Channel Flange	
Gasket Tube Side	Floating Head Cover	
Bolting	Expansion Joint	

NOZZLES	SHELL SIDE NO.	SIZE	RATING & FACING	TUBE SIDE NO.	SIZE	RATING & FACING
Inlet		in.			in.	
Outlet	1	2 in.	300 # RF		in.	
Vent	1	8 in.	300 # RF		in.	
Drain		in.			in.	
Pressure Gauge (Ea Nozzle)		in.			in.	
Thermowell (Ea Nozzle)		in.			in.	
Interconnecting		in.			in.	
Pressure Relief Valve	2	4X6 in.	300 # RF		in.	

REMARKS:

(1) VACUUM CONDITION OCCURS @ AMBIENT CONDITIONS.
(2) THE STEAM GENERATOR IS A VENDOR PACKAGE INCLUDING
- STEAM GENERATOR
- PUMP
- BLOWDOWN DRUM
- CHEMICAL ADDITION TANK
- BOILER FEED WATER CHEMICAL INJECTION PUMP

SAFETY CLASSIFICATION 3
IMPACT LEVEL 3

HWVP12.FRM PAGE 2 OF 2 07/07/92 MLP1.REC1 07/07/92 SAR

ATTACHMENT A

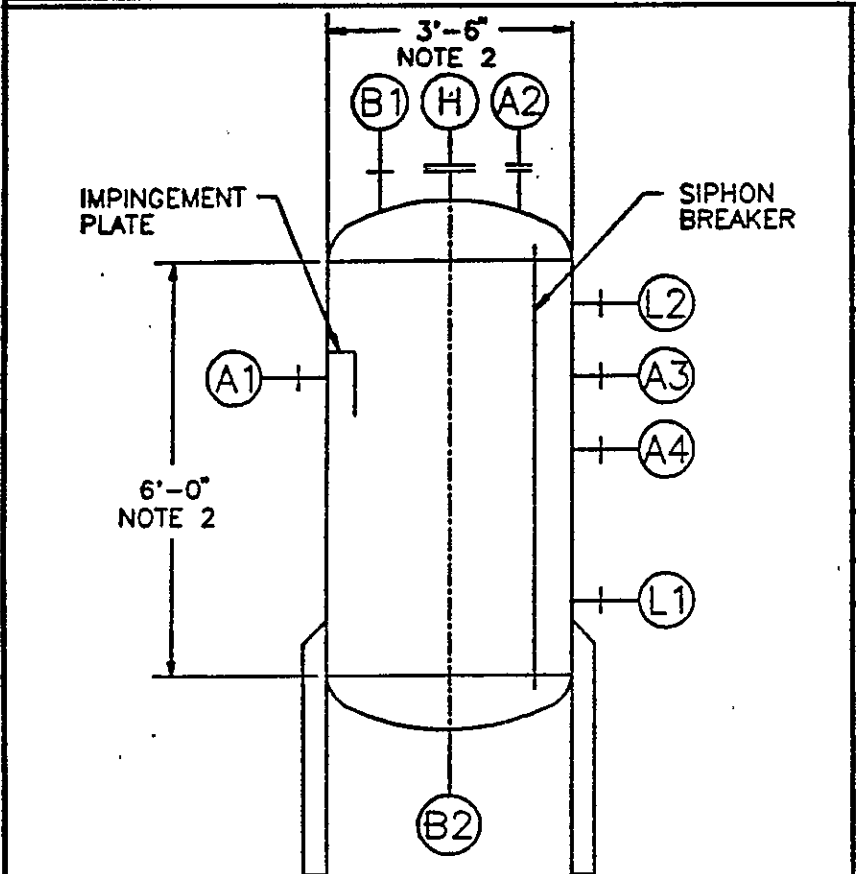
FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

BLOWDOWN DRUM

NO	BY / DATE	REVISION

SHEET NO. DS2 - SH 1 OF 1	REV.
DATE 05-31-89	CONTRACT 845734
TAG NO. 05-430-001V-TK1	
SPECIFICATION SECT NO. 15620	
FOR CLIENT USE	
ORIG JL / CHK'D / APPR'D	



DESIGN CONDITIONS

PRESSURE + 60 PSIG AT 400 °F

VACUUM - N/A PSIG AT N/A °F

LOW TEMP - N/A °F AT N/A PSIG

MAXIMUM LIQUID LEVEL FULL FT

SPECIFIC GRAVITY OF LIQUID 1.0 @ 60 °F

OPERATING CONDITIONS

PRESSURE + ATM PSIG AT 125 °F

VACUUM - N/A PSIG AT N/A °F

LOW TEMP N/A °F AT N/A PSIG

H_2 PARTIAL PRESSURE N/A PSIA AT N/A °F

MATERIALS	CORR ALLOW
SHELL 304L	1/16"
LINING / CLADDING	
INTERNALS *	
TRAYS	
CAPS / VALVES	

INSULATION HOT ☐ COLD ☐

FIREPROOFING YES ☐ NO ☒

NOZZLE	SIZE	SERVICE
A1	1 1/2"	PRS / PRC INLET
B1	1 1/2"	PRC OUTLET
H	12"	MANDHOLE
A2	1 1/2"	SPARE
L2	1"	LEVEL GAUGE (TOP)
A3	3/4"	LPW INLET
L1	1"	LEVEL GAUGE (BOTTOM)
B2	2"	DRAIN OUTLET
A4	2"	OVERFLOW

NOTES & SPECIAL CONDITIONS

STRESS RELIEVE (PROCESS REASON ONLY):

YES ☐ NO ☒

VESSEL IN SOUR WATER SERVICE:

YES ☐ NO ☒

P&ID NO H-2-123352-1

NOTE: 1) THIS EQUIPMENT IS PART OF STEAM GENERATOR PACKAGE SUPPLIED BY VENDOR.
2) PRELIMINARY INFO FROM VENDOR DRAWINGS.

SAFETY CLASSIFICATION 3
QUALITY LEVEL 3

HWVP17 07/09/92 SAR JL1.PL/REC2 07/09/92 SAR

SECTION 15641
STEAM GENERATOR PUMP SYSTEM

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, fabrication, inspection, testing and installation instructions for the steam generator pump system of centrifugal pumps.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5	1988 Pipe Flanges and Flanged Fittings

AMERICAN PETROLEUM INSTITUTE (API)

API STD 610	1989 Centrifugal Pumps for General Refinery Services (7th Edition)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODE

ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	1990 Structural Welding Code Steel (12th Edition)

ANTI-FRICTION BEARING MANUFACTURER'S ASSOCIATION (AFBMA)

AFBMA 9	1990 Load Ratings and Fatigue Life for Ball Bearings
AFBMA 11	1990 Load Ratings and Fatigue Life for Roller Bearings

HYDRAULIC INSTITUTE STANDARDS (HI)

HI	1983 Standards for Centrifugal, Rotary and Recirculating Pumps (14th Edition)

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20	1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA 250	1985 (Rev 88) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electric Code (NEC)

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA Standard Instruction 1-12.14	1978 Guards for Rotating Equipment

STEEL STRUCTURE PAINTING COUNCIL (SSPC)

SSPC-SP 6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operation and Maintenance Data
Specification Section 16150	Motors - Induction
Specification Section 17871	Instruments Furnished with Mechanical Equipment, Electric Steam Generator System

1.4 **DEFINITIONS**

FAT - Factory Acceptance Test

TEFC - Totally Enclosed Fan Cooled

NPSH - Net Positive Suction Head

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Drawings

1.6.1.1 A. Certified dimensional outline drawings. These drawings shall include dimensions, shipping weights, operating weights and clearances to be maintained. They shall also show design temperatures and pressures, operating temperatures and pressures, size and location of all connections, lifting supports, materials of construction and corrosion allowances. Drawings which include the base frame shall include base plate thickness at the foundation bolts, location of anchor bolts and size of control panel fasteners.

B. Sectional drawings. These drawings shall show inside arrangement construction and details for each component.

C. The allowable loads on both the pump discharge nozzles and suction nozzles shall be furnished.

All drawings shall include a detailed bill of materials. This bill shall list the manufacturer, type and ratings of all component parts or assemblies.

1.6.1.2 Electrical Connection Diagrams - Electrical connection diagrams shall depict external electrical connections provided by Seller. Diagrams shall include all connections, schematics, interfaces, wire specifications and wiring to be supplied by Seller. Ratings (in both kVA and HP) for the fully-installed pump drive motor shall also be supplied.

1.6.2 Technical Data

1.6.2.1 Design Calculations - Engineering design analysis with supporting calculations used to establish connected horsepower requirements, shaft sizes, bearing loads and operating characteristics. Calculations shall be complete and in sufficient detail to permit a second party review.

1.6.2.2 Descriptive Literature - Descriptive literature including equipment ratings, model numbers, operating characteristics and technical descriptions.

1.6.2.3 Data Sheets

A. Seller shall complete Data Sheets DS-1, DS-2 and DS-3 (Attachment A) and submit for the furnished equipment.

B. Completed ISA S20 specification forms for process measurement and control instruments, primary elements and control valves.

1.6.2.4 Pump Performance Curves - Pump performance curves shall be provided for pump. Performance curves shall include pump brake horsepower, efficiency, net positive suction head (NPSH) required, viscosity and specific gravity corrections.

1.6.2.5 Nozzle loadings in accordance with API Standard 610 Paragraph 2.4 and Table 2.

1.6.2.6 Factory Acceptance Test Reports (FATs) as defined in Paragraph 2.2.13.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.4 Installation, Operation and Maintenance Manuals

Seller shall provide installation, operation and maintenance manuals. These shall cover the steam generator pump units furnished in accordance with this specification section. The manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and trouble-shooting. Trouble-shooting sections shall include fault trees to guide both mechanical and electrical diagnostics. Reduced size copies of any assembly drawing, subassembly drawing and parts list needed for routine maintenance and overhaul shall be included. This data shall be submitted in accordance with Specification Section 01730.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level	
B.	Barometric Pressure	14.3 psia	
C.	Outside Design Temperature		
	1)	Maximum Design Temperature	110°F
	2)	Minimum Design Temperature	-20°F
	3)	Wet Bulb Design Temperature	68°F
D.	Operating Environment		
	1)	Normal Temperature	60°F to 104°F
	2)	Maximum Temperature	104°F
	3)	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

Pumps furnished in accordance with this specification section shall be centrifugal pumps designed and constructed in accordance with the requirements of API STD 610 for the intended service.

Two type of pumps are covered in this specification section:

A. Circulation pumps (supplied by Seller of steam generator).

B. Process condensate pumps (Gould Pumps Model 3900 or equal).

All exposed moving parts shall have heavy-duty, removable guards provided in accordance with OSHA Standards 1-12.14.

Seller shall be responsible for the design, selection, and performance of the pumps. Pump characteristics and selection shall be in accordance both with API Standard 610 and the Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps (HI). Flanges shall be in accordance with ANSI B16.5.

2.1.2 Baseplates and Supports

A fabricated steel baseplate shall be furnished. This baseplate shall be designed such that all equipment and auxiliary piping are located within its confines. It shall be rigid enough to maintain pump machinery alignment during shipping. The baseplate shall be in accordance with API Standard 610, Paragraph 3.3.

Lifting lugs or other arrangements shall be provided for hoisting and handling the assembled unit during field erection. They shall be designed to carry 150 percent of the unit dry weight.

A. Pump and motor support pads shall be machined flat and in the same plane within 0.002 inch per foot between pads.

B. Motor support pads shall be machined to provide a minimum of 3/16 inch shim height.

C. That portion of the drive base under the pump shall have a drain pan with raised lip construction with drain connection at the pump outboard end.

D. Shaft centerlines shall be of sufficient height above the baseplate to permit the piping of all auxiliary connections.

E. No component of the unit except the motor conduit box shall overhang the drained baseplate.

F. Baseplate shall be in accordance with API Standard 610 Baseplate Numbers 0.5-12. The holes shall be 3/16 inch larger than the required bolt size.

G. Anchor bolt size shall be not less than 3/4 inch diameter.

H. Piping supports shall provide flexibility and accessibility necessary for proper operation and maintenance.

2.1.3 Design Envelope

The maximum equipment envelope for each pump type is as follows:

Circulation Pump:	Process Condensate Pump:
Length - 5 feet, 0 inches	Length - 2 feet, 3 inches
Width - 4 feet, 0 inches	Width - 2 feet, 3 inches
Height - 5 feet, 0 inches	Height - 4 feet, 9 inches

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

The pump operating point shall be within 10 percent of the peak efficiency on the pump performance curve. At design conditions and at maximum horsepower along the pump curve, the horsepower requirements shall not exceed the nominal rating of the motor as shown on the nameplate (excluding service factor).

All rotating parts of the assembled equipment shall operate throughout the required range without excessive vibration, thrust or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the pump skid.

2.2.2 Pump Casing

Pump casings shall be designed for the maximum discharge pressure at pumping temperature and hydrostatic test pressure at ambient temperature. Materials, casting factors and the quality of any welding shall be in accordance with Section VIII, Division 1 of the ASME Code. The pump must come with a casing vent. Code stamp and data report forms are not required.

2.2.3 Materials

Pump casing material shall be in accordance with Table H-1, Class A-7 of the API Standard 610. The material shall be identified in accordance with this standard. Bearings, shafts and grease-lubricated seals shall be manufacturer's standards for the intended service.

Castings shall be sound. No shrink, blow holes, scale, blisters or other defects shall be permitted. Surfaces shall be cleaned by manufacturer's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

2.2.4 Bearings

Bearings shall be sized to take the thrust loads of 150 percent of rated capacity at maximum speed. The life for antifriction bearings specified therein shall be L-10 of 100,000 hours service life calculated in accordance both with AFBMA-9 and AFBMA-11.

2.2.5 Vibration

Major rotating components such as impellers and balancing drums shall be dynamically balanced in accordance with API Standard 610,

Paragraph 2.8.4. Peak-to-peak vibration limits shall apply to all pumps. These limits shall cover rotor vibration during shop and field tests at rated speed and throughout the full operating capacity. Peak-to-peak limits measured on the shaft are:

Speed (rpm)	Anti-Friction Bearings[1]
1800 and below	1.5 mils

(1) Measured on bearing housing

2.2.6 Coupling

Pump manufacturer shall mount pump and motor half couplings. Coupling shall be rated for a minimum of 150 percent of motor nameplate horsepower at design rpm. All metal flexible coupling shall be keyed to both shafts. Couplings and guards shall be in accordance with API Standard 610 Paragraph 3.2.

2.2.7 Safety Guarding

All safety guards, color coding, signs, and accessibility, etc., shall be in accordance with OSHA 1-12.14. Safety guards shall be designed such that the guarded equipment is easily accessible for maintenance.

2.2.8 Alarms

Controllers shall be wired for the standard alarms in accordance with Specification Section 17871.

2.2.9 Electrical Design Requirements

Electric motor shall be provided in accordance both with Specification Section 16150 and this specification section.

Transfer switch for emergency power supply is not required.

All electrical items and assemblies shall be in accordance with NFPA 70, National Electrical Code standards.

A. Motor

Motors shall be integral, totally enclosed fan cooled (TEFC), squirrel-cage, induction type. They shall have normal starting and breakdown torque. Pump and motor assembly with flange mounting is acceptable.

2.2.10 Controls

All controls shall be in accordance with Specification Section 17871. The controls shall include (but not be limited to) circuit breakers, pressure switches and manual shutdown devices. All controls shall be mounted in a NEMA 4X panel fabricated in accordance with NEMA 250.

All control panels shall have provisions for positive direct mechanical anchorage either to an instrument rack or to the building floor.

2.2.11 Coatings

After completion of all fabrication procedures, the external surfaces of each pump shall be thoroughly cleaned of all foreign material, including rust in accordance with SSPC-SP 6. Manufacturer's standard prime and finish paint or coatings shall be applied. Unless specified otherwise, stainless steel surfaces shall not be painted.

2.2.12 Welding

All pump unit assembly welding requirements shall be in accordance both with API Standard 610 Paragraph 2.11.3 standard practice and AWS D1.1.

Baseplates and support welding requirements shall be in accordance with AWS D1.1.

2.2.13 Factory Acceptance Tests (FATs)

A. Seller shall shop-test the unit to verify pump performance. A detailed shop testing procedure shall be submitted prior to testing for review and approval. Buyer shall be notified in advance of all source testing and shall be allowed to witness all tests (FATs).

B. Pump shall be tested at the factory to provide detailed performance data and demonstrate compliance with specifications. The pump shall be hydrostatically tested for a period of time not less than 30 minutes. The test pressure shall be not less than one and one-half times the head capabilities of the maximum diameter impeller for the casing at shutoff, plus the pump maximum allowable suction head. In no case shall the test pressure be less than 250 psig. Pump casing shall be tight at the test pressure. During the test, no visible leakage shall occur at any joint.

C. Seller shall furnish certified shop test curves. They shall show head-capacity, efficiency and brake horsepower of the pump in accordance with API Standard 610 requirements.

2.3 LABELING

The pump and motor shall be supplied with a permanently-affixed tag. The tag shall be of stainless steel. It shall contain the equipment service name as shown on the attached Data Sheets. This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be of corrosion-resistant metal. It shall be permanently attached to pump (not to the baseplate) with stainless steel screws. It shall contain not less than the following information expressed in specified units:

Manufacturer's name
Pump serial number
Pump size and type
Pump rated capacity
Pumping head
Specific gravity
Revolutions per minute
Maximum allowable casing working pressure at maximum pumping temperature

An arrow shall indicate pump rotating direction. The arrow shall be located on the pump's drive end. It shall be integrally-cast or otherwise permanently attached.

2.4 PACKAGING

Packaging and preparation for shipment shall be in accordance with Seller's standards. At minimum, protection shall be provided against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.4.1 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust inhibiting compound.

2.4.2 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with a minimum of four (4) full diameter steel bolts and nuts.

2.4.3 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.4 Pump Unit Assemblies shall be shipped fully assembled on baseplate.

2.4.5 The Controller shall be shipped separately. It shall be field wired to the pump assembly from the remote location.

2.4.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.7 Separate or loose parts shall be boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

2.5 INSPECTION AND TESTING

Inspection and testing shall be in accordance with API Standard 610, Paragraphs 4.1, 4.2 and 4.3.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL U. S. Department of Energy Hanford Waste Vitrification Plant Richland, Washington DOE Contract DE-AC06-86RL10838 **CENTRIFUGAL PUMPS**	NO.	BY / DATE	REVISION	SHEET NO. DS1-SH 1 OF 1	REV. 02
				DATE 03-02-90	CONTRACT 845724
				TAG NO. PX-430-002A PX-430-002B	
				SPECIFICATION SECT NO. 15641	
				FOR CLIENT USE	
				ORIG WR / CHK'D KJM	APPR'D

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: *SECTION 15641*

GENERAL

- Service: *DEMINERALIZED WATER MAKEUP PUMP*
- Pump Mfr.:
- Size & Type:
- No. Stages:
- Serial No.:
- No. Motor Driven: *2*
- Pump Tag No.: *PX-430-002A*, *PX-430-002B*, *DEMINERALIZED WATER MAKEUP PUMP*
- Motor Tag No.: *SAME*
- Motor Provided By: *PUMP MANUFACTURER*

PUMP MATERIALS

- Casing: *304L*
- Impeller: *304L*
- Internal Parts: *304L*
- No. Pumps Req: *2*
- No. Turbine Driven: *NOT APPLICABLE*

LIQUID

- Name: *DEMINERALIZED WATER*
- Pumping Temperature (°F): Normal *70* Max. *100* Min. *50*
- Specific Gravity: @ *70* °F = *1.0*
- Vapor Press. (PSIA): *0.36*
- Viscosity (CP): @ *70* °F = *1.0*
- Corrosion/Erosion Caused By:
- Remarks:

OPERATING CONDITIONS

- Capacity (U.S. GPM): Normal ____ Rated *50*
- Discharge Pressure (PSIG): *50*
- Suction Pressure (PSIG): Max. ____ Rated *0*
- Differential Pressure (PSI): *50*
- Differential Head (Feet): *115*
- NPSH Available (Feet): *25*
- Hydraulic Power (HP): *1.5*

SITE CONDITIONS

- Temp. (°F): Max. *104* Min. *60*
- Rel. Humid. (%): Max. *N.C* Min. *N.C*
- Altitude (Feet): *714*
- ⊗ Indoor ⊗ Heated ○ Roof
- ○ Outdoor ○ Unheated ○ Sun
- Area Classification: *3*
- Other:
- Remarks:

PERFORMANCE (To Be Completed By Manufacturer)

- Proposal Curve No.:
- Speed (RPM):
- Efficiency (%):
- Rated Power (BHP):
- Minimum Continuous Flow (GPM): Thermal ____ Stable ____
- Max. Head Rated Imp. (Feet):
- Max. Power Rated Imp. (BHP):
- NPSH Required (Feet Water): 3% Head Drop
- Suction Specified Speed:

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION
Suction	2"	150	R.F.	
Discharge	2"	150	R.F.	

MISC. CONNECTIONS	SIZE	TYPE
Drain		
Vent		
Pressure Gage		
Warm Up		
Balance Line		

- Casing Mount: ☒ Foot ☐ Bracket
- Centerline ☐ Near Cntrl. ☐ Inline
- Casing Split: ☒ Axial ☐ Radial
- Casing Type: ☒ Diffuser ☐ Staggered
- ☐ Single Volute ☒ Double Volute
- Max. Allowable Pressure (PSIG):
  - At 60 °F
  - At Norm. Pump Temp.
- Hydro Test Pressure (PSIG):
- Lubrication Type: ☒ API 614
  - ☐ Grease ☐ Ring Oil ☐ Oil Mist
  - ☐ Flood ☐ Flinger ☐ Pressure
- Remarks:

- Impeller Diameter (Inches): Rated ____ Max. ____ Min. ____
- Impeller Type: ☐ Open ☒ Closed
- Imp. Suction: ☒ Single ☐ Double
- Imp. Mount: ☐ Btwn. Brgs ☒ Overhung
- Rotation (Coupling End): ☐ CW ☐ CCW
- Bearing (Type/Number):
  - Radial
  - Thrust
- Coupling:
  - Manufacturer
  - Type/Model
- Driver Half-Coupling Mounted By:
  - ⊗ Pump Mfr. ○ Driver Mfr. ○ Purchaser

- Packing:
  - Manufacturer
  - Type
  - Size/No. Rings
- Mechanical Seal:
  - API Class Code *610*
  - Manufacturer
  - Model
  - Mfr. Code
  - ○ Cartridge Type Required
- Gland Type/Mat'l.:
- Gland Plate Taps Required for:
  - ○ Quench ○ Flush ○ Drain ○ Vent

SECP2.FRM 07/08/92 FILE: *NLP6.RL:REC3* *07/08/92 SAR* ○ = By Purchaser ☐ = By Mfr./Purchaser

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

CENTRIFUGAL PUMPS

NO.	BY / DATE	REVISION

SHEET NO. DS2-SH 1 OF 1 | REV. A
DATE 05-31-89 | CONTRACT 845724
TAG NO. GS-430-001V-PX1A, GS-430-001V-PX1B
SPECIFICATION SECT NO. 15641
FOR CLIENT USE
ORIG JL | CHK'D KJM | APPR'D

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: SECTION 15641 P&ID H-2-123352

GENERAL

Service: PROCESS STEAM GENERATOR CIRCULATING PUMPS
Pump Mfr.:
Size & Type:
No. Stages:
Serial No.:

No. Motor Driven: 2
Pump Tag No.: GS-430-001V-PX1A, GS-430-001V-PX1B
PROCESS STEAM GENERATOR CIRCULATING PUMPS
Motor Tag No.: SAME
Motor Provided By: PUMP MANUFACTURER

PUMP MATERIALS

Casing: 304L
Impeller: 304L
Internal Parts: 304L
No. Pumps Req: 2
No. Turbine Driven: NOT APPLICABLE

LIQUID

Name: WATER
Pumping Temperature (°F):
Normal 368 Max. 400 Min.
Specific Gravity: @ 368 °F = 0.88
Vapor Press. (PSIA): 169.2
Viscosity (CP): @ 368 °F = 0.1
Corrosion/Erosion Caused By:
Remarks:

OPERATING CONDITIONS

Capacity (U.S. GPM):
Normal Rated 3000
Discharge Pressure (PSIG): 168
Suction Pressure (PSIG):
Max. Rated 158
Differential Pressure (PSI): 10
Differential Head (Feet): 26
NPSH Available (Feet): 15
Hydraulic Power (HP): 17.2

SITE CONDITIONS

Temp. (°F): Max. 104 Min. 60
Rel. Humid. (%): Max. N.C Min. N.C
Altitude (Feet): 714
☒ Indoor ☒ Heated ○ Roof
○ Outdoor ○ Unheated ○ Sun
Area Classification: 3
Other:
Remarks:

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.:
Speed (RPM):
Efficiency (%):
Rated Power (BHP):
Minimum Continuous Flow (GPM):
Thermal Stable
Max. Head Rated Imp. (Feet):
Max. Power Rated Imp. (BHP):
NPSH Required (Feet Water):
3% Head Drop
Suction Specified Speed:

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION
Suction	VENDOR	300	R.F.	
Discharge	VENDOR	300	R.F.	

MISC. CONNECTIONS	SIZE	TYPE
Drain		
Vent	1/2	
Pressure Gage	1/2	
Warm Up		
Balance Line		

Casing Mount: ☒ Foot ☐ Bracket
Centerline ☐ Near Cntrl. ☐ Inline
Casing Split: ☒ Axial ☐ Radial
Casing Type: ☒ Diffuser ☐ Staggered
☐ Single Volute ☐ Double Volute
Max. Allowable Pressure (PSIG):
At 60 °F
At Norm. Pump Temp.
Hydro Test Pressure (PSIG):
Lubrication Type: ☐ API 614
☐ Grease ☐ Ring Oil ☐ Oil Mist
☐ Flood ☐ Flinger ☐ Pressure
Remarks:

Impeller Diameter (Inches)
Rated Max. Min.
Impeller Type: ☐ Open ☒ Closed
Imp. Suction: ☒ Single ☒ Double
Imp. Mount: ☐ Btwn. Brgs ☒ Overhung
Rotation (Coupling End): ☐ CW ☐ CCW
Bearing (Type/Number):
Radial
Thrust
Coupling:
Manufacturer
Type/Model
Driver Half-Coupling Mounted By:
☒ Pump Mfr. ○ Driver Mfr. ○ Purchaser

Packing:
Manufacturer
Type
Size/No. Rings
Mechanical Seal:
API Class Code 610
Manufacturer
Model
Mfr. Code
○ Cartridge Type Required
Gland Type/Mat'l.:
Gland Plate Taps Required for:
○ Quench ○ Flush ○ Drain ○ Vent

SECP2.FRM 07/08/92 FILE: NLP6.RL:REC2 07/15/92 SAR ○ = By Purchaser ☐ = By Mfr./ Purchaser

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

CENTRIFUGAL PUMPS

NO.	BY / DATE	REVISION

SHEET NO. DS3-SH 1 OF 1 | REV. A
DATE 03-21-90 | CONTRACT 845724
TAG NO. PX-430-001A, PX-430-001B
SPECIFICATION SECT NO. 15641
FOR CLIENT USE
ORIG WR | CHK'D KJM | APPR'D

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: SECTION 15641

GENERAL

Service: PROCESS STEAM CONDENSATE PUMP
Pump Mfr.:
Size & Type:
No. Stages: 1
Serial No.:

No. Motor Driven: 2
Pump Tag No.: PX-430-001A, PX-430-001B
PROCESS STEAM CONDENSATE PUMP
Motor Tag No.: SAME
Motor Provided By: PUMP MANUFACTURER

PUMP MATERIALS

Casing: SS 304L
Impeller: SS 304L
Internal Parts: SS 304L
No. Pumps Req: 2
No. Turbine Driven: NOT APPLICABLE

LIQUID

Name: STEAM CONDENSATE
Pumping Temperature (°F):
Normal 125 Max. 212 Min.
Specific Gravity: @ 125 °F = 0.99
Vapor Press. (PSIA): 1.9
Viscosity (CP): @ 125 °F = 0.6
Corrosion/Erosion Caused By:
Remarks:

OPERATING CONDITIONS

Capacity (U.S. GPM):
Normal 60 Rated 60
Discharge Pressure (PSIG): 202
Suction Pressure (PSIG):
Max. 2 Rated 0
Differential Pressure (PSI): 202
Differential Head (Feet): 467
NPSH Available (Feet): 25
Hydraulic Power (HP): 7.0

SITE CONDITIONS

Temp. (°F): Max. 104 Min. 60
Rel. Humid. (%): Max. N.C. Min. N.C.
Altitude (Feet): 714
⊗ Indoor ⊗ Heated ○ Roof
○ Outdoor ○ Unheated ○ Sun
Area Classification: 3
Other:
Remarks:

PERFORMANCE (To Be Completed By Manufacturer)

Proposal Curve No.:
Speed (RPM):
Efficiency (%):
Rated Power (BHP):

Minimum Continuous Flow (GPM):
Thermal Stable
Max. Head Rated Imp. (Feet):
Max. Power Rated Imp. (BHP):

NPSH Required (Feet Water):
3% Head Drop
Suction Specified Speed:

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION
Suction	3	300	R.F.	
Discharge	1-1/2	300	R.F.	

MISC. CONNECTIONS	SIZE	TYPE
Drain		
Vent	1/2	
Pressure Gage	1/2	
Warm Up		
Balance Line		

Casing Mount: ☐ Foot ☐ Bracket
Centerline ☐ Near Cntrl. ☒ Inline
Casing Split: ☒ Axial ☐ Radial
Casing Type: ☒ Diffuser ☐ Staggered
☐ Single Volute ☒ Double Volute
Max. Allowable Pressure (PSIG):
At 60 °F
At Norm. Pump Temp.
Hydro Test Pressure (PSIG):
Lubrication Type: ☒ API 614
☐ Grease ☐ Ring Oil ☐ Oil Mist
☐ Flood ☐ Flinger ☐ Pressure
Remarks:

Impeller Diameter (Inches)
Rated Max. Min.
Impeller Type: ☐ Open ☒ Closed
Imp. Suction: ☒ Single ☐ Double
Imp. Mount: ☐ Btwn. Brgs ☒ Overhung
Rotation (Coupling End): ☐ CW ☐ CCW
Bearing (Type/Number):
Radial
Thrust
Coupling:
Manufacturer X
Type/Model
Driver Half-Coupling Mounted By:
○ Pump Mfr. ○ Driver Mfr. ○ Purchaser

Packing:
Manufacturer
Type
Size/No. Rings
Mechanical Seal:
API Class Code X
Manufacturer
Model
Mfr. Code
○ Cartridge Type Required
Gland Type/Mat'l.:
Gland Plate Taps Required for:
○ Quench ○ Flush ○ Drain ○ Vent

○ = By Purchaser ☐ = By Mfr./ Purchaser

SECP2.FRM 07/08/92 FILE: NLPS.RL:REC 1 07/08/92

SECTION 15643
DEMINERALIZER SYSTEM

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the design, performance, fabrication, inspection and testing of a demineralizer system to provide feed water to an electric steam generator.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5	1988 Pipe Flanges and Flanged Fittings
ANSI B73.1M	1991 Specification Horizontal End Suction Centrifugal Pumps for Chemical Process

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODE

ASME Section VIII Division 1	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

AMERICAN SOCIETY FOR TEST AND MATERIALS (ASTM)

ASTM A217/A217M	1991 Standard Specification for Steel Castings, Martensitic Stainless and Alloy for, Pressure-Containing Parts, Suitable for High-Temperature Service
ASTM A480/A480M	1991 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	1990 Structural Welding Code Steel (12th Edition)

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20	1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA 250	1985 (Rev 88) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION, INC. (NFPA)

NFPA 70	1990 National Electric Code (NEC)

OCCUPATION SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA 1-12.14	1978 Guards for Rotating Equipment

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operation and Maintenance Data
Specification Section 05063	Welding Pressure Vessels
Specification Section 13433	Pressure Vessels - Stainless Steel
Specification Section 16150	Motors - Induction
Specification Section 17871	Instruments Furnished with Mechanical Equipment, Electric Steam Generator System

1.4 **DEFINITIONS**

DCS - Distributive Control System

FAT - Factory Acceptance Test

PPM - Parts per Million

GPM - Gallons per Minute

1.5 **SYSTEM DESCRIPTION**

(Not Used)

DIVISION 16 - ELECTRICAL		REVISION NO.
Section	**Title**	
16150	Motors - Induction	0
16610	Electrical Requirements for Electric Steam Generator	0

DIVISION 17 - INSTRUMENTATION		
Section	**Title**	
17870	Electric Steam Generator System Control Panel	0
17871	Instruments Furnished with Mechanical Equipment Electric Steam Generator System	0
17871A	Safety Class Relief Valves Furnished with Electric Steam Generator (Safety Class 1)	0

PACKAGE TRANSMITTAL ATTACHMENT

DRAWING NUMBER	SHT NO.	REV	DATE	DRAWING TITLE
H-2-120160	1	0	07/21/92	TK-430-002 PROCESS CONDENSATE COLLECTION TANK
H-2-120195	1	0	07/21/92	TK-430-001 DEMINERALIZED WATER STORAGE TANK
H-2-120195	2	0	07/21/92	TK-430-001 DEMINERALIZED WATER STORAGE TANK DETAILS
H-2-121705	1	0	07/21/92	LP-430-001 INSTRUMENT PANEL LAYOUT

TRANSMITTAL ATTACHMENT FOR PACKAGE SPECIFICATIONS

SPEC NUMBER	PKG REV	SECT REV	PACKAGE TITLE	SECT	SECTION TITLE
B-595-P-P33A	0		STEAM GENERATOR		
		0		01730	OPERATION AND MAINTENANCE DATA
		0		05063	WELDING PRESSURE VESSELS
		0		13252	PRECAUTIONS F/FAB HNDLG & STRG OF SS STL
		0		13433	PRESSURE VESSELS - STAINLESS STEEL
		0		15620	ELECTRIC STEAM GENERATOR
		0		15641	STEAM GENERATOR PUMP SYSTEM
		0		15643	DEMINERALIZER SYSTEM
		0		15644	STEAM CONDENSATE COOLER
		0		15647	CHEMICAL INJECTION SYSTEM
		0		15896	HEPA FILTERS (MECHANICAL)
		0		15897	PARTICULATE FILTERS/ION EXCHANGER UNIT
		0		16150	MOTORS - INDUCTION
		0		16610	ELECT REQUIREMENTS FOR ELECT STEAM GNTOR
		0		17870	ELECT STEAM GENERATOR SYSTEM CNTRL PANEL
		0		17871	INSTR FRNSHD W/MECH EQUP ELECT STM GNTOR
		0		17871A	SFTY CLS RLF VLVS FRNSHD W/ELEC STM GNTR

SPECIFICATIONS

STEAM GENERATOR
B-595-P-P33A

HANFORD WASTE VITRIFICATION PLANT

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE

FLUOR DANIEL
ADVANCED TECHNOLOGY DIVISION
CONTRACT 8457

DOE CONTRACT NO.
DE-AC06-86RL10838

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

STEAM GENERATOR
SPECIFICATION B-595-P-P33A

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0
ISSUE DATE 7-21-92

SAFETY CLASS *3

*With Exception of Specification Section 17871A which is Safety Class 1 Quality Level 1 As Noted

APPROVED BY:

R. E. Haney	Procurement Packages P.E.	July 17, 1992 Date
B. E. Byers	Area Project Manager	7/17/92 Date
G. N. Kimura	Engineering Project Manager	7-17-92 Date
J. L. Smets	Systems Manager	7-20-92 Date
A. K. Yee	Independent Safety Manager	7-20-92 Date
J. G. Kelly	Q. A. Manager	7/21/92 Date
R. S. Poulter	Project Director	7/21/92 Date

9317975.0397

STEAM GENERATOR
(B-595-P-P33A)

TABLE OF CONTENTS
TECHNICAL SPECIFICATION

DIVISION 1 - GENERAL REQUIREMENTS		REVISION NO.
Section	**Title**	
01730	Operation and Maintenance Data	0
DIVISION 5 - METALS		
Section	**Title**	
05063	Welding Pressure Vessels	0
DIVISION 13 - SPECIAL CONSTRUCTION		
Section	**Title**	
13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys	0
13433	Pressure Vessels - Stainless Steel	0
DIVISION 15 - MECHANICAL		
Section	**Title**	
15620	Electric Steam Generator	0
15641	Steam Generator Pump System	0
15643	Demineralizer System	0
15644	Steam Condensate Cooler	0
15647	Chemical Injection System	0
15896	HEPA Filters (Mechanical)	0
15897	Particulate Filters/Ion Exchanger Unit	0

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Drawings

1.6.1.1 A. Certified dimensional outline drawings. These drawings shall include dimensions, shipping weights, operating weights and clearances to be maintained. They shall also show design temperatures and pressures, size and location of all connections, lifting supports, materials of construction and corrosion allowances. Drawings which include the base frame shall include base plate thickness at the foundation bolts, location of anchor bolts and size of control panel fastenings.

B. Sectional drawings. These drawings shall show inside arrangement construction and details for each component.

C. Allowable loads shall be furnished both for the discharge and suction nozzles on every pump within the demineralizer system.

All drawings shall include a detailed Bill of Materials. This shall list manufacturer, type and rating of all components.

1.6.1.2 Electrical Connection Diagrams - Electrical connection diagrams shall depict external electrical connections provided by Seller. Diagrams shall include all connections, schematics, interfaces, wire specifications and wiring to be supplied by Seller. Ratings (in both kVA and HP) for the fully-installed demineralizer system shall also be supplied.

1.6.2 Technical Data

1.6.2.1 Design Calculations - Seller shall provide an engineering design analysis with supporting calculations used to establish horsepower requirements, shaft sizes bearing loads and operating characteristics. These calculations shall be complete to permit second-party review.

1.6.2.2 Descriptive Literature - Descriptive literature shall be provided. This literature shall include equipment ratings, model numbers, operating characteristics and technical descriptions.

1.6.2.3 Data Sheets

A. Seller shall complete Data Sheet DS-1 Sheets 1 and 2 (Attachment A) and submit for the furnished equipment.

B. Complete ISA S20 specification forms for process measurement and control instruments, primary elements and control valves.

1.6.2.4 Performance Curves - Performance curves shall be provided. These curves shall include brake horsepower, efficiency, required net positive suction head (NPSH), viscosity and specific gravity corrections for the pumps in the system. The performance curves for the entire demineralizer system shall also be provided.

1.6.2.5 Nozzle loadings in accordance with ANSI B73.1M.

1.6.2.6 Factory Acceptance Tests (FATs) as defined in Paragraph 2.2.6.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement either from original manufacturer or any subsupplier.

1.6.4 Installation, Operation and Maintenance Manuals

Seller shall provide installation, operation and maintenance manuals. These shall cover the demineralizer furnished in accordance with this specification. These manuals shall fully detail sequences of disassembly, repair, adjustment, reassembly, lubrication and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. The manuals shall include reduced-size copies of any assembly drawing, subassembly drawing or parts list needed for routine maintenance and overhaul. This data shall be submitted in accordance with Specification Section 01730.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
1)	Maximum Design Temperature	110°F
2)	Minimum Design Temperature	-20°F
3)	Wet Bulb Design Temperature	68°F

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

The demineralizer system's primary objective is to supply demineralized feed water to the electric steam generator. At minimum, the following requirements shall be met.

2.1.1.1 The flow rate of the demineralized product water shall be not less than 7 gallons per minute (gpm), inclusive. Flow rate shall not exceed 10 gpm, inclusive.

2.1.1.2 The water produced by the demineralizer system shall have a total hardness of not more than 0 parts per million (ppm) of $CaCO_3$.

2.1.1.3 The water produced by the demineralizer system shall have a pH range value between 7.0 and 7.8, inclusive.

2.1.1.4 The water produced by the demineralizer system shall have a total alkalinity of between 0 and 400 ppm of $CaCO_3$, inclusive.

2.1.1.5 The water produced by the demineralizer system shall have a total iron content of not more than 2 ppm.

2.1.1.6 The water produced by the demineralizer system shall have a total oxygen content of not more than 0.005 ppm.

2.1.1.7 The conductivity of the water produced by the demineralizer system shall not exceed 350 μmho/cm (micromho).

2.1.2 Pumps furnished with the demineralizer system shall be designed and constructed in accordance with ANSI B73.1M. Seller shall be responsible for pump selection and performance.

All exposed moving parts shall have heavy-duty removable guards provided in accordance with OSHA 1-12.14.

2.1.3 A remote start/stop contact shall be provided. This contact shall be rated for 2A at 120V, resistive. It shall stop the demineralizer system upon deenergization by Buyer's distributive control system (DCS).

2.1.4 Baseplates and Supports

A fabricated steel drive baseplate shall be furnished. This baseplate shall be designed such that all equipment and auxiliary piping are located within its confines. The maximum available envelope for the demineralizer system is:

Length - 27 feet, 0 inches
Width - 8 feet, 0 inches
Height - 10 feet, 0 inches

Lifting lugs or other arrangements for hoisting and handling the assembled unit during field erection shall be provided.

A. No unit component except the motor conduit box shall overhang the drained area of the baseplate. The baseplate shall be equipped with a drain. The drain nozzle shall not be less than 2 inches in diameter.

B. Piping supports shall provide flexibility and accessibility necessary for proper operation and maintenance. Piping, tubing and conduit shall be routed and supports located to provide flexibility and accessibility for proper operation and maintenance. All piping, tubing and conduit shall be adequately supported and restrained. Supports and restraints shall be steel. They shall be compatible with piping, tubing and conduit material.

2.1.5 Anchorage Provisions

The base of the demineralizer system shall have provisions to be anchored with a minimum of four 13/16 inch diameter holes for 5/8 inch diameter anchor bolts.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 General Requirements

All rotating parts of the assembled equipment shall operate throughout the required range without excessive vibration, thrust or noise. The noise level shall not exceed 85 dB at 3 feet peripheral around the demineralizer skid.

2.2.2 Materials

2.2.2.1 All manufactured vessels shall be Type 304L stainless steel in accordance with ASTM A480/A480M.

2.2.2.2 All pressure vessels and pressure-containing components shall be built in accordance both with ASME Section VIII, Division I and Specification Section 13433. Welding shall be in accordance with Specification Section 05063.

2.2.2.3 All castings shall be Type 304L stainless steel in accordance with ASTM A217/A217M.

Castings shall be sound. No shrink, blow holes, scale, blisters or other defects shall be permitted. Surfaces shall be cleaned by Seller's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

2.2.2.4 The skid-mounted system shall be welded in accordance with AWS D1.1.

2.2.2.5 Pipe connections 2 inches and larger shall be butt-welded. Pipe connections smaller than 2 inches shall be socket-welded.

2.2.2.6 All piping shall be in accordance with ANSI B16.5.

2.2.3 Resin

One full charge of resin (if resin is used) shall be supplied and shipped separately from the demineralizer.

2.2.4 Electrical Components

Electrical components shall be built in accordance with NFPA 70. Electric motors shall be in accordance with Specification Section 16150.

The following electrical supplies shall be available in accordance with Specification Section 16150:

A. 480 Volt, 3 phase, 60 Hz.
B. 120 Volt, single phase, 60 Hz.

2.2.5 Coatings

All coating and painting shall be in accordance with manufacturer's standard. Unless otherwise specified, stainless steel surfaces shall not be painted. Assembled equipment of the demineralizer system shall be delivered in a rust-free condition.

2.2.6 Factory Acceptance Tests (FATs)

Seller shall shop test the demineralizer system to verify performance in accordance with the conditions stated in Paragraphs 2.1.1 and 2.2.2.2. Detailed shop testing procedures and test reports shall be submitted for Buyer review and approval before testing begins. Buyer shall be notified in advance of all source testing. Buyer reserves the right to witness all tests (FATs).

2.3 LABELING

The demineralizer system shall be supplied with a permanently-affixed tag. The tag shall be of stainless steel. It shall contain the equipment service name as shown on Data Sheet DS-1 (Attachment A). This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be of corrosion-resistant metal. It shall be permanently attached to the demineralizer system baseplate with stainless steel screws. The identification plate shall be stamped or embossed with not less than the following information expressed in specified units:

Manufacturer's name
Serial number for all components
Size and type of component
Working and design condition for each component
Rated capacity of demineralizer
Maximum allowable working pressure at maximum pumping temperature

2.4 PACKAGING

2.4.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparations shall include the requirements listed below.

2.4.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.4.3 Flanged openings shall be covered with wood or plastic protectors. When metallic protectors are used, a nonmetallic gasket shall be installed between the flange and protector. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.4.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.5 The demineralizer system shall be shipped fully assembled on its skids.

2.4.6 The Controller shall be shipped separately. It shall be field-wired to the demineralizer system from the remote location assigned by Buyer.

2.4.7 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.8 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit. If resin is used, one full charge of resin shall be supplied separately from the demineralizer.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHEMET A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

DEMINERALIZER SYSTEM

NO	BY / DATE	REVISION

SHEET NO. D61-8H 1 OF 2 | REV.
DATE 02-27-92 | CONTRACT 845734
TAG NO. DM-430-003V
SPECIFICATION SECT NO. 15643
FOR CLIENT USE
ORIG BB | CHK'D | APPR'D

TREATED WATER USE (COOLING, BOILER FEED OR OTHER) BOILER FEED
NO UNITS REQ'D 1 UNITS IN CONTINUOUS OPERATION INTERMITTANT

WATER ANALYSIS

CONSTITUENT	PPM AS	INFLUENT	EFFLUENT
CALCIUM	$CaCO_3$	48	
MAGNESIUM	$CaCO_3$	22	
SODIUM	$CaCO_3$	5	
HYDROGEN - ACIDITY	$CaCO_3$	—	
POTASSIUM			
TOTAL CATIONS	$CaCO_3$	75	
SILICA	SiO_2	4.3	
IRON	Fe	0.08	
CARBON DIOXIDE, FREE	CO_2	—	
TOTAL DISSOLVED SOLIDS		92	
TURBIDITY		< 0.4	

CONSTITUENT		PPM AS	INFLUENT	EFFLUENT
BICARBONATES	ALKALINITY	$CaCO_3$	42	
CARBONATES	ALKALINITY	$CaCO_3$	12	
HYDROXIDE	ALKALINITY	$CaCO_3$	—	
CHLORIDE		$CaCO_3$	6	
SULFATE		$CaCO_3$	15	
CONDUCTIVITY (MTS)			141	
TOTAL ANIONS		$CaCO_3$	75	
M ALKALINITY		$CaCO_3$	54	
P ALKALINITY		$CaCO_3$	6	
TOTAL HARDNESS		$CaCO_3$	70	0
pH			8.5	7.0-7.8

OPERATING CONDITIONS

NUMBER OF TRAINS IN CONTINUOUS OPERATION 1
GUARANTEED TOTAL PLANT THROUGHPUT 7
SERVICE RATE (NORMAL/PEAK), (GPM/FT ^{2}) N/A
INFLUENT / EFFLUENT WATER TEMPERATURE, (° F) 70°

ALLOWABLE △ P - OVERALL, (PSIG) 50
LENGTH RUN BEFORE REGENERATION, (HRS)
CONTROL: MANUAL ☐ SEMI - AUTOMATIC ☐ AUTOMATIC ☒
INFLUENT PRESSURE, (PSIG) 60

MECHANICAL DESIGN

DESIGN PRESSURE (CODE ☐ NON - CODE ☐), (PSIG)
DESIGN TEMPERATURE, (° F)
TANK DIAMETER, (IN)
SIDE SHELL OF TANK, (IN)
TANK LINING MATERIAL
TANK LINING THICKNESS, (IN)
MANHOLE

	HEADER LATERAL	HUB LATERAL	OTHER
INLET DISTRIBUTOR			
REGENERANT DISTRIBUTOR			
INTERFACE COLLECTOR			
UNDERDRAIN			

INTERNAL MATERIAL: STAINLESS STEEL ☐ PVC ☐ OTHER ☐
PIPING MATERIAL: SIZE LINING
VALVES MATERIAL: SIZE LINING

DEGASIFIER (YES ☐ NO ☐) N/A

CAPACITY GPM
SERVICE RATE: GPM / SQ FT
DIA IN HEIGHT FT
MATERIAL
BLOWER: NO CFM HP
DEGASIFIER BASIN: INCLD ☐ NOT INCL ☐

RESIN CHARACTERISTICS BY VENDOR

	CATION	ANION	MIXED BED CATION	MIXED BED ANION
TYPE				
VOLUME (CU FT)				
CAPACITY (KGR /CU FT)				
FREEBOARD				

REGENERANT AND CHEMICAL REQUIREMENTS BY VENDOR NOTE 1

REGEN ACID LEVEL (66 ° H_2SO_4 ☐ 100% HCl ☐) LB / CU FT
TYPE OF REGENERATION:
REGENERANT CAUSTIC LEVEL: LB / CU FT
CAUSTIC APPLIED AT % TEMP ° F
CHEMICAL / REGENERANT: ACID LBS CAUSTIC LBS

SAFETY CLASSIFICATION
IMPACT LEVEL

ATTACHMENT A

FLUOR DANIEL
Specification Sheet

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

DEMINERALIZER SYSTEM
(Continued)

NO	BY / DATE	REVISION
1		
2		
3		
4		
5		
6		

SHEET NO. 081-8H 2 OF 2	REV.
DATE 02-27-92	CONTRACT 845734
TAG NO. DM-430-003V	
SPECIFICATION SECT NO. 15643	
FOR CLIENT USE	
ORIG BB / CHK'D / APPR'D	

BACKWASH AND REGENERANT WASTE *NOTE 1*

BACKWASH FLOW RATE:	CATION		GPM	TOTAL		GALLONS
	ANION		GPM	TOTAL		GALLONS
REGENERANT FLOW RATE:	CATION		GPM	TOTAL		GALLONS
	ANION		GPM	TOTAL		GALLONS
RINSE FLOW RATE:	CATION		GPM	TOTAL		GALLONS
	ANION		GPM	TOTAL		GALLONS
TOTAL WATER TO WASTE						GALLONS

ITEMS TO BE INCLUDED BY MANUFACTURER

1 ST CHARGE RESIN(S)	[x]	DIL WATER PRESS VALVE(S)	[ ]	ACID / CAUSTIC PUMP & DR	[ ]
RESIN DISCHG CONN	[ ]	DIL WATER FLOW INDICATOR(S)	[ ]	WATER METER	[ ]
RESIN TRAP(S)	[ ]	DIL WATER SHUT - OFF VALVE(S)	[ ]	BOOSTER PUMP & DR	[ ]
SKID MOUNTIG	[x]	SILICA MONITOR	[ ]	BACKWASH PUMP & DR	[ ]
OBSERVATION PORT(S)	[ ]	ACID / CAUSTIC INLET VALVE(S)	[ ]	RINSE PUMP & DR	[ ]
CONDUCTIVITY INST	[ ]	CAUSTIC HEATING EQUIPMENT	[ ]	DEGAS TRANS PUMP & DR	[ ]
ACID / CAUSTIC FLOW METER(S)	[ ]	ACID / CAUSTIC PIPING	[ ]	PRIME PRINT	[ ]
ACID / CAUSTIC MIXING TEE(S)	[ ]	ACID / CAUSTIC STOR TAML(S)	[ ]		[ ]

ALARMS TO BE INCLUDED BY MANUFACTURER

H / L TEMP IN CAUSTIC LINE [ ] HIGH EFFLUENT CONDUCTIVITY [ ] HIGH SILICA [ ]
H / L CONDUCTIVITY DOWNSTREAM OF ACID / CAUSTIC DILUTION [ ] CATION BREAKTHROUGH PROBE [ ]
REFERENCE OTHER EQUIPMENT SPECIFICATION SHEETS _____

REMARKS: *1. NO REGENERANT CHEMICALS PERMITTED EXCEPT SALT.*

SKETCH:

SAFETY CLASSIFICATION _____
IMPACT LEVEL _____

SECTION 15644
STEAM CONDENSATE COOLER

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the minimum technical requirements for design, fabrication, inspection, and testing of the shell and tube heat exchanger for the Process Steam Condensate Cooler. The exchanger will be installed in the Hanford Waste Vitrification Plant in Richland, Washington.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI B16.5	1988 Pipe Flanges and Flanged Fittings

AMERICAN PETROLEUM INSTITUTE (API)

API STD 660	1982 Shell-and-Tube Heat Exchangers for General Refinery Services (4th Edition)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODE

ASME Section II, Part A	1989 Material Specifications - Ferrous Materials (Addenda 1990)
ASME Section V	1989 Nondestructive Examination
ASME Section VIII, Division I	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

STEEL STRUCTURE PAINTING COUNCIL (SSPC)

SSPC-SP 6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION (TEMA)

TEMA Standards	1988 Standards of the Tubular Exchanger Manufacturers Association (7th Edition) (1990 Errata)

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operation and Maintenance Data
Specification Section 05063	Welding Pressure Vessels
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

1.4 **DEFINITIONS**

DP - Design Pressure

MAWP - Maximum Allowable Working Pressure

NDE - Nondestructive Examination

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 General Arrangement Drawings

The general arrangement or outline drawing shall contain the following information:

A. The service, item number, project name and location, purchase order number and Manufacturer shop order number.

B. Design pressure, test pressure, design temperature, joint efficiency and corrosion allowance in accordance with Data Sheet DS-1, Sheet 1 and 2 (Attachment A).

C. The applicable codes and specifications.

D. Material specifications, including grades, for all pressure parts in accordance with SA480/SA480M of Section II, ASME Boiler and Pressure Vessel Code.

E. Overall dimensions. This shall include all clearances which must be maintained.

F. Thicknesses for shell, channel and supports.

G. Locations (elevations and orientation) of every connection to the equipment (e.g., nozzles, brackets, clips, lifting lugs, instruments connections, etc.).

H. Dimensions and locations of supports. This shall include size of anchor bolt slotted holes.

I. Nozzle size, rating, facing and direction of flow.

J. Weights of the exchanger unit, both empty and filled with water. Weight of the removable tube bundle. Dimensional clearance required for tube bundle removal.

K. Postweld heat treatment requirements.

L. Radiographic and other examination requirements.

M. Surface preparation and painting requirements.

N. Packaging and shipping details for approval.

1.6.2 Detail Drawing

Shop fabrication or cross sectional and other detail drawings. These drawings shall contain the following information:

A. Full dimensions of all parts and subassemblies. Required tolerances and finishes where applicable.

B. A complete, fully-specified list of materials. Certifications or degree of testing shall be included if they form part of the material specifications. This shall be required if the assembly drawings list the materials only in general terms.

C. Gasket sketches for all joints. These shall show dimensions, type, materials and the number required. Gasket details shall be submitted on separate drawings. These shall not be marked with restrictions for use.

D. Details of test rings.

1.6.3 Data Sheets

A. Seller shall complete Data Sheet DS-1 Sheets 1 and 2 (Attachment A) and submit for the furnished equipment.

1.6.4 Mechanical design calculations for pressure-retaining parts shall be stamped by a Professional Engineer and submitted. These calculations shall have all supporting calculations, steps and data identified. They shall be sufficiently complete to show conformance with the contract specifications and their supplements, and all applicable codes and standards. The calculations shall be in sufficient detail to permit second party review. Where computers are used for code calculations all assumptions and input data shall be supplied together with the computer-generated output.

1.6.5 Code Data Book. This shall include the following:

A. Certified mill test reports. These shall state the specification to which the material complies, the chemical analysis, physical properties and any heat treatment the material was given.

B. Manufacturer Data Report, Forms U-1, U-1A or U-2, ASME Code, Section VIII, Division 1.

C. Heat treatment charts.

D. Nameplate rub off.

E. Hydrotest chart.

F. NDE test results.

G. "As-Built" data sheets.

1.6.6 Welding submittals in accordance with Specification Section 05063.

1.6.7 A list of manufacturer's recommended spare parts for one year's routine operation. Sufficient data to permit procurement from the original manufacturer or any subsupplier shall be included.

1.6.8 Inspection and checklist shall be in accordance with Paragraph 2.6.

1.6.9 Operation and maintenance data in accordance with Specification Section 01730.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

Climactic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
(1)	Maximum Design Temperature	110°F
(2)	Minimum Design Temperature	-20°F
(3)	Wet Bulb Design Temperature	68°F

1.8.1 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Equipment

The following requirements shall apply to the shell and tube heat exchanger (Shell and Tube, Inc.; Type BGU, Size 17 x 120 or equal) furnished in accordance with this Specification Section (15644).

A. General

1) Except as specified herein, the exchangers shall be in accordance with Sections 1, 2, 3, 5 (Class R), 8, and 12 of the TEMA Standards and API STD 660. They shall be designed, fabricated, inspected and tested in accordance with the ASME Code, Section VIII, Division 1 and additional requirements of the drawings and specifications. ASME Code Stamp is required.

2) Seller shall guarantee performance of the exchanger with regard to capacity, heat duty and pressure drop in accordance with the process conditions on the Data Sheets.

3) The exchangers shall be fabricated, tested and shipped fully assembled. The exchangers shall be hydrostatically tested in accordance with ASME Code, Section VIII, Division 1 at the pressure specified in accordance with Seller's approved code design calculations.

4) All water used for cleaning, rinsing, testing and mixing of solutions shall be potable water in accordance with Specification Section 13252.

5) Type 304L stainless steel shall be used for fabrication. The shell shall be of stainless steel manufactured in accordance with SA480/SA480M of ASME Code, Section II. The tubes shall be stainless steel manufactured in accordance with SA268/SA268M of ASME Code, Section II. These materials shall be in accordance with the material specifications, grade and condition specified on the exchanger data sheets. All pressure-retaining materials shall be in accordance with ASME Code, Section II.

6) Seller shall verify that the materials are in accordance with the data sheets. Such verification shall be recorded in the inspection records.

7) Gaskets shall be of non-asbestos material.

8) All welded tubing shall pass a nondestructive electric test in accordance with SA450/SA450M of ASME Code, Section II.

9) Nozzle flanges shall be in accordance with ANSI B16.5.

10) The maximum equipment envelope is:

Length - 13 feet, 6 inches
Width - 3 feet, 0 inches
Height - 3 feet, 0 inches

2.2 FABRICATION AND MANUFACTURE

2.2.1 Except as otherwise noted, fabrication shall be in accordance both with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and this specification section.

A. Each U-tube shall be formed from a single length. No circumferential welds shall be permitted.

B. All welding shall be in accordance with Specification Section 05063.

C. When TEMA type "B" channels are used with removable bundle exchangers, the stationary tubesheet shall be extended to the same diameter as the flange. At minimum, every other hole shall be threaded.

D. At minimum, all exchanger exterior and interior metal surfaces (except weld beads) shall maintain the finish of the original material. All weld surfaces on the exchanger interior shall be ground smooth. Their contour shall be blended with the adjacent surfaces.

E. Design pressure and temperature shall be in accordance with Data Sheet DS-1, Sheets 1 and 2 (Attachment A). This will be the design pressure and temperature stamped on the exchanger nameplate. Maximum allowable working design pressure (MAWP) is equal to design pressure (DP).

F. Shop hydrostatic test pressure shall be 1.5 times MAWP.

2.2.2 Shells

A. All longitudinal and circumferential welds of the shell shall be finished flush with the inner contour for ease of tube-bundle insertion and withdrawal.

B. The permissible out-of-roundness of a completed shell shall allow a metal template to pass completely through the shell without binding. The template shall consist of two rigid discs, each having a diameter equal to the diameter of the transverse baffle. The discs shall be rigidly mounted perpendicularly on the shaft 12 inches apart.

C. Support saddle attachment plates shall have all corners rounded to a minimum of 1 inch radius. The plates shall be welded to the shell with a continuous seal weld. They shall have a 1/8 inch pipe size tapped hole.

2.2.3 Pass Partition Plates

Pass partition plates for forged or welded channels and floating heads shall either be welded full-length from both sides or shall have full penetration welds.

2.2.4 Heat Treatment

A. Heat Treatment after bending for the bend portion of U-tubes is specified as follows: austenitic stainless steel tube shall be solution annealed.

B. The heat-treated portion of the U-bend shall extend at least 6 inches beyond the point of tangency.

2.2.5 Support and Anchorage

Each saddle shall have provisions to be anchored to an elevated steel platform. Two (2) 1 inch diameter bolts shall be used at each saddle. Bolt holes at anchor end saddle shall be 1-1/16 inch in diameter. Bolt holes at sliding end saddle shall be slots, 1-1/16 inch by 2-1/2 inch. These slots shall be oriented in the exchanger's longitudinal direction.

2.3 LABELING

The steam condensate cooler shall be supplied with a permanently-affixed tag. The tag shall be of stainless steel. It shall contain the equipment service name as shown on Data Sheet DS-1 (Attachment A). This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be of corrosion-resistant metal. It shall be permanently attached to the equipment with stainless steel screws. The identification plate shall be stamped or embossed with not less than the following information expressed in specified units:

Manufacturer's name
Equipment serial number
Equipment size and type
Equipment rated capacity
Date of manufacture
Maximum allowable working pressure at maximum design temperature

2.4 **PACKAGING**

Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.4.1 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.4.2 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.4.3 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.4 Equipment assemblies shall be shipped fully assembled on their baseplates.

2.4.5 Gaskets shall be shipped installed on all body flange assemblies. Spare gaskets shall be enclosed in a plywood container. This container shall be protected from damage and shall be securely attached to the exchanger crate. The gasket container shall be indelibly marked both with the purchase order number and equipment number.

2.4.6 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.7 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

2.5 **COATINGS**

After completion of all fabrication procedures the external surfaces of each heat exchanger shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC-SP 6. Manufacturer's standard prime and finish paint or coatings shall be applied. Unless specified otherwise, stainless steel surfaces shall not be painted.

2.6 INSPECTION AND TESTS

2.6.1 Nondestructive Examination

A. Nondestructive examination methods and acceptance shall be in accordance both with Specification Section 05063 and ASME Code Section V.

B. The specific requirements for nondestructive examination shall be as shown by NDE symbols on Seller's drawings.

2.6.2 Pressure Tests

A. The steam condensate cooler shall be hydrostatically tested at the pressure listed in Paragraph 2.2. The procedure shall be in accordance with the ASME Code, Section VIII, Division 1, Paragraph UG-99(b). Test pressure shall be held for not less than one hour.

B. Prior to any leak testing the steam condensate cooler shall be wiped clean of loose rust particles, scale, chips, grease and other foreign matter. The inside of the exchanger shall be blown clean with Nitrogen in accordance with Specification Section 13252.

C. The hydrostatic testing medium shall be potable water in accordance with Specification Section 13252.

D. Additional welding on the exchanger shall not be permitted after hydrostatic testing.

E. The exchanger shall be thoroughly drained and dried after testing in accordance with the requirements of Specification Section 13252.

2.6.3 Shop Inspection

A. Seller shall perform shop inspections of the exchanger. Seller's inspection personnel shall be qualified in accordance with Paragraph UG-91(a) of the ASME Code. The reference to the inspector in Paragraph UG-90 shall also apply to Seller.

B. The alternative inspections in accordance with Paragraph UG-90(c-2) of the ASME Code shall not be permitted.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SHELL AND TUBE HEAT EXCHANGER

NO	BY / DATE	REVISION

SHEET NO. DS1-SH 1 OF 2	REV. 0
DATE 02-08-89	CONTRACT 845724
TAG NO. CD-430-001	
SPECIFICATION SECT NO. 15644	
FOR CLIENT USE	
ORIG KM/BAB	CHK'D / APPR'D

Client . DOE
Service PROCESS STEAM CONDENSATE CONDENSER / COOLER
Design Duty 5.47 MM Btu / Hr
Transfer Rate Service ____ Clean ____ Btu / Hr Ft ^{2} ° F
Total Surface (Eff) ____ Ft ^{2} Shells / Unit ____

Vendor ____
Plant HWVP
Size HORIZONTAL
Mtd. (Eff.) ____ °F
Surface / Shell (Eff) ____ Ft ^{2}

PERFORMANCE OF ONE UNIT

		SHELL SIDE		TUBE SIDE	
FLUID NAME		STEAM CONDENSATE (1)		TOWER WATER	
Total Flow	Lbs / Hr	24,000		182,290	
		INLET	OUTLET	INLET	OUTLET
LIQUID	Lbs / Hr				
Molecular Weight					
Density	Lb / Ft ^{3}				
Thermal Cond.	Btu / Hr Ft ^{2} °F / Ft				
Specific Heat	Btu / Lb °F				
Viscosity	Cp				
Surface Tension	Dyne / Cm				
Bubble Point	°F				
VAPOR	Lbs / Hr				
Molecular Weight					
Density	Lb / Ft ^{3}				
Thermal Cond.	Btu / Hr Ft ^{2} ° F / Ft				
Specific Heat	Btu / Lb ° F				
Viscosity	Cp				
Latent Heat	Btu / Lb				
Dew Point	°F				
Non - Condensables	Lbs / Hr				
Molecular Weight					
Steam	Lbs / Hr	3,160			
Water	Lbs / Hr	20,840	24,000	182,290	182,290
Temperature	°F	226	125	75	105
Pressure (Atmos 14.3 Psia)	Psig	5.0		57.0	
Pressure Drop	Psi	ALLOW.: 5.00 CALC.:		ALLOW.: 10.0 CALC.:	
Velocity	Ft / Sec				
Fouling Resistance	Hr Ft ^{2} ° F / Btu	0.0005		0.001	
Additional Data on Sheet No.					

REMARKS:

(1) INLET STREAM IS IN TWO PHASE FLOW

SAFETY CLASSIFICATION 3
IMPACT LEVEL 3

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

SHELL AND TUBE HEAT EXCHANGER

NO	BY / DATE	REVISION

SHEET NO.	REV.
DS1-SH 2 OF 2	0
DATE	CONTRACT
02-06-89	845724
TAG NO.	
CD - 430 - 001	
SPECIFICATION SECT NO.	
15644	
FOR CLIENT USE	
ORIG / CHK'D / APPR'D	
KM/BAB	

		SHELL SIDE		TUBE SIDE	
Design Pressure	Psig	195 & FULL VACUUM (1)		100	
Test Pressure	Psi				
Design Temperature	°F	390		150	
Corrosion Allowance	in.				
Number of Passes					
Diff Des Pressure	Psig				
Flow Arrangement		Parallel	Series	Parallel	Series

CONSTRUCTION

Shell Dia (ID) (OD)	in.	Baffle Type		Wt Bundle & Shell	Lbs.
No. Tubes / Shell		No * Spacing	X in.	Wt Bundle	Lbs.
OD * Length In. X	in.	Segmental Cut	% Dia.	Wt Full of Water	Lbs.
Gauge Bwg (min.)	in.	Impingement Baffle		RHO V^2 Inlet Nozzle	
Tube Pitch Layout	Deg.	Expansion Joint		RHO V^2 Bundle Entr	
Tema Class R		Exp Joint Des Temp		RHO V^2 Bundle Exit	
Code Req (ASME) SECT. VIII DIV. 1		Surface Prep		Specifications	
Code Stamp Yes		Paint			
Removeable Tube Bundle Yes		Insulation Yes No		Lethal Service Stamp	

MATERIALS (MARK STRESS RELIEVED - SR, RADIOGRAPHED - XR)

Tubes	304L SS	Shell	304L SS
Tubesheet		Shell Cover	
Baffles / Tubesupports		Shell Flange	
Tie Rods and Spacers		Channel / Bonnet	
Long Baffle		Channel Cover	
Gasket Shell Side		Channel Flange	
Gasket Tube Side		Floating Head Cover	
Bolting		Expansion Joint	

NOZZLES	SHELL SIDE NO.	SIZE	RATING & FACING	TUBE SIDE NO.	SIZE	RATING & FACING
Inlet	1	4 in.	150 # RF	1	6 in.	150 # RF
Outlet	1	4 in.	150 # RF	1	6 in.	150 # RF
Vent	1	1 in.	150 # RF		in.	
Drain		in.			in.	
Pressure Gauge (Ea Nozzle)		in.			in.	
Thermowell (Ea Nozzle)		in.			in.	
Interconnecting		in.			in.	
*>p						

REMARKS:

(1) VACUUM CONDITIONS OCCUR AT AMBIENT TEMPERATURE

SAFETY CLASSIFICATION 3

IMPACT LEVEL 3

SECTION 15647
CHEMICAL INJECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the technical requirements for the design, fabrication, inspection and testing of the chemical injection pump, the chemical injection tank and the agitator for the electric steam generator.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code

ASME Section VIII, Division I	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A217/A217M	1991 Standard Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
ASTM A480/A480M	1991 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip

HYDRAULIC INSTITUTE STANDARDS (HI)

HI	1983 Standards for Centrifugal, Rotary and Reciprocating Pumps (14th Edition)

STEEL STRUCTURE PAINTING COUNCIL (SSPC)

SSPC-SP 6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 01730 Operation and Maintenance Data

Specification Section 16150 Motors - Induction

1.4 **DEFINITIONS**

COC - Certificate of Conformance

FAT - Factory Acceptance Test

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certification of Conformance (COC) of the chemical injection pumps to the requirements of this specification section and data sheets DS-1 and DS-2 (Attachment A).

1.6.2 Chemical injection system outline drawing. Dimensions, weights, anchor bolts and base plate details shall be indicated.

1.6.3 Electrical Connection Diagrams

Electrical connection diagrams shall depict external electrical connections provided by Seller for all pump drive motor circuits. Diagrams shall include all connections, schematics, interfaces, wire specifications and wiring to be supplied by Seller. Ratings (in kVA and HP) for the fully-installed pump and agitator drive motor shall also be supplied.

1.6.4 A list of manufacturer's recommended spare parts for one (1) year's routine operation. Include sufficient data to permit procurement either from the original manufacturer or any subsupplier.

1.6.5 Installation, operation and maintenance manuals in accordance with Specification Section 01730.

1.6.6 Design Calculations

A mechanical design analysis shall be supplied by Seller. This analysis shall include supporting calculations used to establish connected horsepower, shaft sizes, bearing loads and operating

characteristics. Calculations shall be complete and in sufficient detail to permit a second party review.

1.6.7 Data Sheets

A. Seller shall complete Data Sheets DS-1 and DS-2 (Attachment A) and submit for the furnished equipment.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
(1)	Maximum Design Temperature	110°F
(2)	Minimum Design Temperature	-20°F
(3)	Wet Bulb Design Temperature	68°F

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 **MATERIALS AND EQUIPMENT**

A. The chemical injection pump shall be a controlled-volume pump (Neptune Chemical Pump Company Model EC5-115F or equal) furnished in accordance both with this specification section and Data Sheet DS-1 (Attachment A). The pump shall be capable of continuous operation throughout the range of its capacity. The pump shall be of the diaphragm type, automatically controlled by an outside electrical signal. The diaphragm shall be actuated by a mechanically-coupled push rod. The diaphragm isolates the push rod from the process

fluid. A built-in relief valve (PSV-DWX-028) shall be included to relieve the pump's full capacity. This relief valve shall be set at 20 percent above the maximum operating discharge pressure. Guided, controlled-travel, double-ball check valves shall be provided on both suction and discharge. Valves shall have renewable seats of either the screwed-in or shouldered type. Oil lubrication shall be performed either by splash or force-feed system. The pump shall be provided with a manual local stroke adjustment. This is in addition to the remote volume adjuster.

B. The chemical injection pump shall be furnished with an automatic volume control. The control shall be actuated by the conductivity of the electric steam generator water. The feed water volume/capacity control shall be continuously variable from no flow to maximum capacity condition. Repetitive accuracy of all the volume adjustments shall be not less than 98 percent between the range of 10 to 100 percent of the specified pump capacity.

C. The chemical injection tank listed in DS-2 (Attachment A) shall be made of Type 304L stainless steel in accordance with ASTM A480/A480M.

D. The chemical injection tank agitator shall be suitable for mixing the boiler feed water chemicals. It shall have adequate electric power to mix a batch capacity of 200 gallons. The agitator shall be of the portable type. It shall be manufactured of Type 304L stainless steel in accordance with ASTM A480/A480M. The agitator shall have no excessive shaft whip or vibration within the range of operation from full to empty tank. The agitator's electric drive motor shall be in accordance with Specification Section 16150.

E. The chemical injection system shall be a skid-mounted system. The maximum available equipment envelope is as follows:

Length - 7 feet, 0 inches
Width - 4 feet, 0 inches
Height - 5 feet, 0 inches

2.1.1 Anchorage Requirements

A. The chemical injection tank (GS-430-001V-TK2) shall have provisions to be anchored with a minimum six 1/2 inch diameter anchor bolts. Bolt holes shall be 11/16 inch diameter.

B. The chemical injection pump (GS-430-001V-PX2) shall have provisions to be anchored with a minumum 4-3/8" diameter bolts. Bolt holes shall be 7/16" diameter.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Material for the chemical injection pump shall be made in accordance with ASTM A217/A217M. Castings shall be sound. No shrink, blow holes, scale, blister and other defects shall be permitted. Surfaces shall be cleaned by manufacturer's standard methods. All casting burrs shall be filed or ground flush with the casting surface. The use of plastic or cement compounds to repair leaks and defects in pressure casings shall not be permitted.

Design stress, temperature restrictions and physical properties for the pump material shall be in accordance with the limitations for similar materials in Section VIII, Division I of the ASME Code. Pressure-containing parts shall be built in accordance with Section VIII, Division I of the ASME Code. Code stamp and data report forms are not required.

2.2.2 The electric motors for the chemical injection pump and the chemical injection tank agitator shall both be made in accordance with Specification Section 16150.

2.2.3 Flexible couplings and baseplate are used as required by the pump design and manufacturer's standards.

2.3 LABELING

2.3.1 The chemical injection system shall be supplied with a permanently-affixed tag. The tag shall be of stainless steel. It shall contain the equipment service name as shown on Data Sheets DS-1 and DS-2 (Attachment A). This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be of corrosion-resistant metal. It shall be permanently attached to the equipment baseplate with stainless steel screws. The identification plate shall be stampled or embossed with not less than the following information expressed in specific units:

Manufacturer's name
Equipment serial number
Equipment size and type
Test pressure and temperature
Equipment rated capacity
Maximum allowable working pressure at design temperature
Contract or purchase order number
Equipment weight after assembly

2.3.2 The built-in relief valve PSV-DWX-028 (Service description = Chemical Injection Relief Valve) shall be added to the pump tag.

2.4 **PACKAGING**

2.4.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.4.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.4.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.4.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.5 Equipment assemblies shall be shipped fully assembled on their baseplates.

2.4.6 The Controllers shall be shipped separately. They shall be field-wired to the equipment from the remote location.

2.4.7 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.8 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

2.5 **COATINGS**

After completion of all fabrication procedures the external surfaces of each pump shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC-SP 6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

2.6 TESTING

2.6.1 Factory Acceptance Tests (FATs)

The factory acceptance tests shall be performed in accordance with the requirements of HI.

2.6.2 Test procedures for hydrostatic testing, production testing and calibration testing with inspection shall be in accordance with HI test standards.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

METERING PUMPS

NO.	BY / DATE	REVISION

SHEET NO. DS1-SH 1 OF 1 | REV. A
DATE 06-01-92 | CONTRACT 845724
TAG NO. GS-430-001V-PX-2 / GS-430-001V-PX-2
SPECIFICATION SECT NO. 15647
FOR CLIENT USE
ORIG JL | CHK'D | APPR'D

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS: SECTION 15647 H-2-123352-1

GENERAL

Service: BOILER FEED WATER CHEM INJECT PUMP
Pump Mfr.:
Size & Type: DIAPHRAGM
No. Stages:
Model No.: BY VENDOR

No. Motor Driven: 1
Pump Tag No.: GS-430-001V-PX-2
Motor Tag No.: GS-430-001V-PX-2
Speed: CONSTANT Enclosure: TEFC
HP ___ RPM ___ VOLTS ___ PH ___ Hz ___

PUMP MATERIALS

Casing: 304L
Impeller:
Internal Parts: 304L
No. Pumps Req: 1
No. Turbine Driven: NOT APPLICABLE

LIQUID

Name: VENDOR
Pumping Temperature (°F):
Normal 70 Max. ___ Min. ___
Specific Gravity: @ 70 °F = VENDOR
Vapor Press. (PSIA): VENDOR
Viscosity (CP): @ 70 °F = VENDOR
Corrosion/Erosion Caused By: VENDOR
Remarks:

OPERATING CONDITIONS

Capacity (U.S. GPH):
Max 60 Min 6 Norm VENDOR
Discharge Pressure (PSIG):
Max 200 Min 0 Norm VENDOR
Suction Pressure (PSIG) :
Max 2 Min 0 Norm VENDOR
NPSHA Available (Feet): VENDOR
Hydraulic Power (HP):
Differential Head (Feet):

SITE CONDITIONS

Temp. (°F): Max. 104 Min. 60
Rel. Humid. (%): Max. N.C Min. N.C
Altitude (Feet): 714
⊘ Indoor ⊘ Heated ○ Roof
○ Outdoor ○ Unheated ○ Sun
Area Classification: 3
Other:
Remarks:

PERFORMANCE (To Be Completed By Manufacturer)

Max Capacity: 60
Speed (RPM): VENDOR
Efficiency (%):
Rated Power (BHP):

Minimum Continuous Flow (GPH):
Thermal ___ Stable ___
Max. Disch Press W/Quoted Dr Vendr PSI
Max. Disch Press W/Max Dr Vendr PSI

NPSH Required (Feet Water):
3% Head Drop VENDOR
Suction Specified Speed:

CONSTRUCTION (To Be Completed By Purchaser and Manufacturer)

NOZZLES	SIZE	RATING	FACING	LOCATION
Suction				
Discharge				

MISC. CONNECTIONS	SIZE	TYPE
Drain		
Vent		
Pressure Gage		
Warm Up		
Balance Line		

Casing Mount: ☐ Foot ☐ Bracket
Centerline ☐ Near Cntrl. ☐ Inline
Casing Split: ☐ Axial ☐ Radial
Casing Type: ☐ Diffuser ☐ Staggered
☐ Single Volute ☐ Double Volute
Max. Allowable Pressure (PSIG):
At 60 °F
At Norm. Pump Temp.
Hydro Test Pressure (PSIG):
Lubrication Type: ☐ API 614
☐ Grease ☐ Ring Oil ☐ Oil Mist
☐ Flood ☐ Flinger ☐ Pressure
Remarks: THIS PUMP IS PART OF THE STEAM GENERATOR PKG SUPPLIED BY VENDOR

Impeller Diameter (Inches)
Rated ___ Max. ___ Min. ___
Impeller Type: ☐ Open ☐ Closed
Imp. Suction: ☐ Single ☐ Double
Imp. Mount: ☐ Btwn. Brgs ☐ Overhung
Rotation (Coupling End): ☐ CW ☐ CCW
Bearing (Type/Number):
Radial
Thrust
Coupling:
Manufacturer
Type/Model
Driver Half-Coupling Mounted By:
⊘ Pump Mfr. ○ Driver Mfr. ○ Purchaser

Packing:
Manufacturer
Type
Size/No. Rings
Mechanical Seal:
API Class Code
Manufacturer
Model
Mfr. Code
○ Cartridge Type Required
Gland Type/Mat'l.:
Gland Plate Taps Required for:
○ Quench ○ Flush ○ Drain ○ Vent

○ = By Purchaser ☐ = By Mfr./ Purchaser

ATTACHMENT A

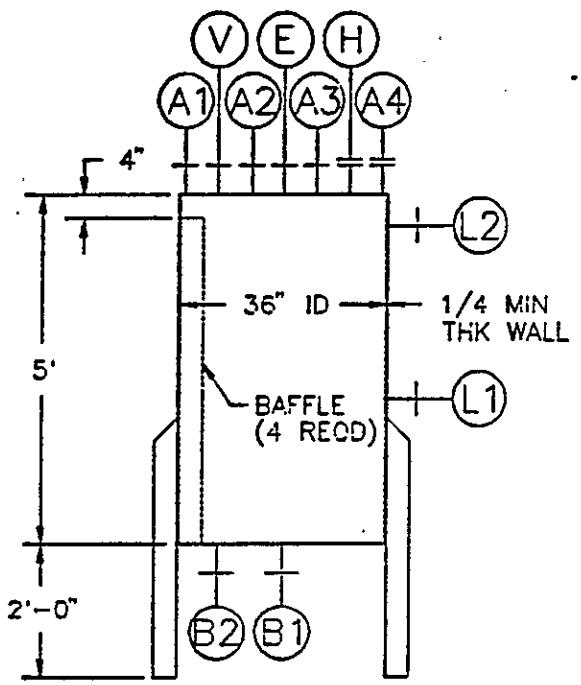
FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

CHEMICAL INJECTION TANK

NO	BY / DATE	REVISION

SHEET NO. DS2 - 8H 1 OF 1	REV. 01
DATE 05-31-89	CONTRACT 845734
TAG NO. 06-430-001V-TK-2	
SPECIFICATION SECT NO. 15647	
FOR CLIENT USE	
ORIG JL / CHK'D KPM / APPR'D	



DESIGN VOLUME: 250 GAL

NOZZLE	SIZE	SERVICE
A1	4"	HOPPER INLET
A2	3/4"	DWX INLET
A3	2"	INLET FROM PRESSURE RELIEF
A4	4"	SPARE W / BLIND FLANGE
B1	3/4"	DRAIN OUTLET
B2	1"	OUTLET TO PUMP
E	12"	AGITATOR
H	12"	INSPECTION HOLE W/BLND FLANGE & GRAB BARS
L1	1"	LEVEL GAGE (BOTTOM)
L2	1"	LEVEL GAGE (TOP)
V	3"	VENT

DESIGN CONDITIONS

PRESSURE + ATM PSIG AT 120 ° F
VACUUM - — PSIG AT — ° F
LOW TEMP - N/A ° F AT — PSIG
MAXIMUM LIQUID LEVEL FULL FT
SPECIFIC GRAVITY OF LIQUID 1.2 @ 60 ° F

OPERATING CONDITIONS

PRESSURE + ATM PSIG AT 70 ° F
VACUUM - — PSIG AT — ° F
LOW TEMP N/A ° F AT N/A PSIG
H_2 PARTIAL PRESSURE N/A PSIA AT N/A ° F

MATERIALS	CORR ALLOW
SHELL 304L	1/16"
LINING / CLADDING	
INTERNALS *	
TRAYS	
CAPS / VALVES	

INSULATION HOT ☐ COLD ☐
FIREPROOFING YES ☐ NO ☒

NOTES & SPECIAL CONDITIONS

STRESS RELIEVE (PROCESS REASON ONLY):
YES ☐ NO ☒

VESSEL IN SOUR WATER SERVICE:
YES ☐ NO ☒

P&ID NO H-2-123352-1
NOTE: THIS EQUIPMENT IS PART OF STEAM GENERATOR PACKAGE SUPPLIED BY VNEDOR.

SAFETY CLASSIFICATION 3
QUALITY LEVEL 3

HWVP17 07/08/92 SAR JL1.RLREC.1 07/08/92 SAR

P33A - 15647

SECTION 15896
HEPA FILTERS (MECHANICAL)

PART 1 GENERAL

1.1 SUMMARY

This specification section establishes the minimum requirements for high efficiency particulate air (HEPA) filters to be used in an environmental protection application on the vent stream from the process condensate collection tank.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.5	1988 Pipe Flanges and Flanged Fittings
ANSI B1.20.1	1983 Pipe Threads, General Purpose (Inch)
ANSI/ASME NQA-1	1989 Quality Assurance Program Requirements for Nuclear Facilities
ANSI/ASME N509	1989 Nuclear Power Plant Air-Cleaning Units and Components; Interpretations
ANSI/ASME N510	1989 Testing of Nuclear Air Treatment Systems
ANSI 586	1990 UL Standard for Safety of High-Efficiency, Particulate, Air Filters Units, Seventh Edition

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A176	1990 Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM D1056	1985 Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

MILITARY SPECIFICATIONS (MIL)

MIL-F-51068	1988 (Rev F) Filter, Particulate, (High-Efficiency Fire Resistant)
MIL-F-51079	1988 (Rev D) Filter Medium Fire Resistant, High-Efficiency

NUCLEAR STANDARD

NE F3-45T	1984 Specifications for HEPA Filters used by DOE Contractors

STEEL STRUCTURE PAINTING COUNCIL (SSPC)

SSPC-SP 6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 01730 Operation and Maintenance Data

1.4 **DEFINITIONS**

FAT - Factory Acceptance Test

HEPA - High Efficiency Particulate Air

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certification of Compliance of filter performance to the requirements both of this specification section and Data Sheet DS-1 (Attachment A).

1.6.2 HEPA filter outline drawings, dimensions and weight.

1.6.3 Detail drawings of the HEPA filter housing and its various components. The drawings shall also contain weights, anchor bolt details and materials used.

1.6.4 Data Sheets

Seller shall submit complete data sheets for the furnished equipment. These data sheets shall reflect the design parameters in Data Sheet DS-1 (Attachment A).

1.6.5 A list of manufacturer's recommended spare parts for one (1) year's routine operation. Include sufficient data to permit procurement either from the original manufacturer or any subsupplier.

1.6.6 Installation, operation and maintenance manuals in accordance with Specification Section 01730.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
(1)	Maximum Design Temperature	110°F
(2)	Minimum Design Temperature	-20°F
(3)	Wet Bulb Design Temperature	68°F

1.8.2 Operating Environment

1)	Normal Temperature	60°F to 104°F
2)	Maximum Temperature	104°F
3)	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

The following requirements apply to the HEPA filters (Flanders Model CC9 or equal) furnished in accordance with this specification section.

2.1.1 Filter Medium

The material for the HEPA filter medium shall be in accordance both with MIL-F-51079 and ANSI/ASME N509.

2.1.2 HEPA Filter Housing

The materials for the HEPA filter housing shall be in accordance both with ASTM A176 Type 304L and ANSI/ASME N509.

2.1.3 Adhesives

Adhesives used both to seal the filter pack into the case and glue gaskets to the case shall either be nonflammable or self-extinguishing. Where the dried film is exposed to an open flame, it shall either not burn or not continue to support combustion when the source of ignition is removed.

2.1.4 Gaskets and Seals

The gasket material used shall be a flat gasket of the nonasbestos type. The gasket shall be oil and ozone-resistant synthetic rubber, closed cell sponge, Grade RE-43 or Grade TE-43 (high temperature) in accordance with ASTM D1056. It shall be 1/4 inch thick by 3/4 inch wide with split or cut surfaces.

2.1.5 Design Envelope

The maximum equipment envelope is:

Length - 3 feet, 6 inches
Width - 4 feet, 6 inches
Height - 2 feet, 6 inches

2.2 FABRICATION AND MANUFACTURE

Fabrication and manufacture of the HEPA filter assembly shall be in accordance with ANSI/ASME N509, MIL-F-51068, MIL-F-51079 and ANSI 586. It shall be in accordance with ANSI/ASME NQA-1 requirements.

2.2.1 The HEPA filter housing shall be designed for bag-in/bag-out capability suitable for installation of a single-element HEPA filter. The housing shall allow the operator to change filters without coming into direct contact with the filter element.

2.2.2 Each housing door shall be equipped with a double ribbed bag-out port designed for accepting an 8 mil polyvinyl chloride (PVC) bag. Housing shall be designed to prevent ripping or tearing of the bag during operation.

2.2.3 Two bags, one for equipment start-up and one spare, shall be provided and shipped with each HEPA filter housing. The bags shall include integral shock cord and mittens to facilitate changeout.

2.2.4 One banding kit shall be supplied with the HEPA filter housing. The kit shall include all tools and straps necessary for a complete bag-out procedure.

2.2.5 HEPA filter housing flanges shall be in accordance with ANSI B16.5. Pipe threads shall be in accordance with ANSI B1.20.1.

2.2.6 Welding

All welding for the HEPA filter assembly shall be in accordance with ANSI/ASME N509.

2.2.7 The HEPA filter housing shall have provisions to be anchored to an elevated platform with not less than six (6) bolts. These bolts shall be 1/2 inch in diameter. Bolt holes shall be 9/16 inch in diameter.

2.3 **TESTING**

2.3.1 Factory acceptance tests (FATs) in accordance both with ANSI/ASME N510 and NE F3-45T.

2.3.2 Testing of HEPA filter assembly shall be in accordance both with ANSI/ASME N510 and NE F3-45T.

2.4 **LABELING**

2.4.1 The HEPA filter shall be supplied with a permanently-affixed tag. The tag shall be of stainless steel. It shall contain the equipment service name as shown on Data Sheet DS-1 (Attachment A). This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be of corrosion-resistant metal. It shall be permanently attached to the

equipment with stainless steel screws. The identification plate shall be stamped or embossed with not less than the following information expressed in specified units:

Manufacturer's name
Equipment serial number
Equipment size and type
Date of manufacture
Test pressure and temperature
Equipment rated capacity
Maximum allowable working pressure at design temperature
Contract or purchase order number
HEPA filter weight after assembly

2.5 **PACKAGING**

2.5.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.5.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.5.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.5.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.5.5 Equipment assemblies shall be shipped full assembled on their baseplates.

2.5.6 The Controllers shall be shipped separately. They shall be field-wired to the equipment from the remote location.

2.5.7 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.5.8 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

2.6 COATINGS

After completion of all fabrication procedures the external surfaces of the process condensate HEPA filters shall be thoroughly cleaned of all foreign material, including rust in accordance with SSPC-SP 6. Manufacturer's standard prime and finish paint or coatings shall be supplied. Stainless steel shall not be painted unless specified otherwise.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

HEPA FILTERS

NO	BY / DATE	REVISION

SHEET NO.	REV.
D&1 - SH 1 OF 1	00
DATE 01-13-89	CONTRACT 845724
TAG NO.	FH-430-001A FH-430-001B
SPECIFICATION SECT NO.	15896
FOR CLIENT USE	
ORIG BAB	CHK'D SSL / APPR'D

TITLE *PROCESS CONDENSATE HEPA FILTER*

NO UNITS REQ'D 2 NO UNITS OPERATING 1 SPARE 1 TYPE (HORIZONTAL __) (VERTICAL X)

TYPE ELEMENT (THROW - AWAY X) (CLEANABLE __) OTHER

PROCESS DESIGN

NAME OF FLUID FILTERED	AIR & WATER VAPOR	
QUANTITY FLUID FILTERED	431 (DESIGN = 575)	# / HR
OPERATING PRESSURE	- 0.1	PSIG
OPERATING TEMPERATURE	150 °F	°F
DENSITY @ OPER TEMP	0.0596	LB / FT ^{3}
VISCOSITY @ OPER TEMP	.02	C_p
ALLOWABLE DIRTY PRESSURE DROP	.1	PSI
NAME OF PARTICLES REMOVED	PARTICLES CONTAMINATED W/RADIOACTIVE COMP	
MAXIMUM PARTICLE SIZE		MICRON
MINIMUM PARTICLE SIZE		MICRON
SIZE OF PARTICLES REMOVED	99.97 WT % OF 0.3 MICRON & LARGER	MICRON
QUANTITY PARTICLES TO BE REMOVED		# / HR

MECHANICAL DESIGN

DESIGN PRESSURE 5/FV PSIG DESIGN TEMPERATURE 150 °F CORROSION ALLOWANCE

CODES: ASME (YES X) (NO __) STAMP (YES X) (NO __) OTHER

MATERIALS OF CONSTRUCTION	
FILTER CASE	304L SS
FILTER COVER	
FILTER ELEMENT SUPPORTS	
FILTER CASE SUPPORTS	
FILTER CONNECTIONS	
ELEMENTS	
GASKETS	

* CONNECTIONS	NO	SIZE	RATING
INLET	1	4	150 # RF
OUTLET	1	4	150 #RF
VENT			
DRAIN			
INSTRUMENTS			
DOP INLET			

* ALL CONNECTIONS 2" AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON X, SWING BOLTED-ON __, CLAMP-ON __, SCREWED __, SPECIAL - SEE NOTES)

DAVIT (YES __) (NO X): FILTER CASE SUPPORTS (YES __) (NO __) MINIMUM HEIGHT

SANDBLAST (YES __) (NO X): PAINT PRIMER (YES __) (NO X)

DATA BY VENDORS

MFR TYPE NO

NO REQ'D : NO OPERATING : NO SPARE

NO ELEMENTS EACH FILTER : SIZE " O.D. x "STR: MATERIAL

TOTAL ELEMENT DIRT HOLDING CAPACITY CU FT : SURFACE SQ FT

CLEAN PRESSURE DROP PSI: SHIPPING WEIGHT

DESCRIBE METHOD OF REMOVING ELEMENTS:

IS DIMENSIONAL OUTLINE INCLUDED (YES __) (NO __) IS FILTER IN ACCORD WITH SPECS (YES __) (NO __)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS

SAFETY CLASSIFICATION 3
IMPACT LEVEL 3

SECTION 15897
PARTICULATE FILTER/ION EXCHANGER UNIT

PART 1 GENERAL

1.1 SUMMARY

This specification section describes the requirements for design, material, fabrication, inspection, installation and testing for the Particulate Filter/Ion Exchange Unit.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B1.20.1	1988 Pipe Threads
ANSI B16.5	1988 Pipe Flanges and Flanged Fittings
ANSI B31.3	1990 Chemical Plant and Petroleum Refinery Piping

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
BOILER AND PRESSURE VESSEL CODE

ASME Section VIII, Division I	1989 Rules for Construction of Pressure Vessels (Addenda 1991)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A403/A403M	1991 Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM A480/A480M	1991 General Requirements for Flat Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	1990 Structural Welding Code Steel, Twelfth Edition

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20	1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA ICS#6	1988 (Rev 89) Enclosures for Industrial Controls and Systems
NEMA 250	1985 (Rev. 88) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electric Code (NEC)

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA 1-12.14	1978 Guards for Rotating Equipment

STEEL STRUCTURE PAINTING COUNCIL (SSPC)

SSPC-SP 6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operation and Maintenance Data
Specification Section 05063	Welding Pressure Vessels
Specification Section 13433	Pressure Vessels - Stainless Steel
Specification Section 15641	Steam Generator Pump System
Specification Section 16150	Motors - Induction

1.4 **DEFINITIONS**

TEFC - Totally Enclosed Fan Cooled

FAT - Factory Acceptance Test

1.5 **SYSTEM DESCRIPTION**

The particulate filter/ion exchange unit is a condensate polishing filter demineralizer system. It shall be used only in circumstances where radioactive contamination is present in the process

condensate return. The particulate filter/ion exchange unit clears the contamination and feeds clean condensate to the electric steam generator.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Drawings

1.6.1.1 A. Certified dimensional drawings. These drawings shall include dimensions, shipping and operating weights and clearances to be maintained for each component in the system. They shall also show design and operating temperatures and pressures, size and location of all lifting supports and material of construction. Drawings which include the base frame shall include baseplate thickness.

B. Sectional drawings. These drawings shall show inside arrangement construction and details for each component.

C. All drawings shall include a detailed Bill of Materials. This bill shall list the manufacturer, type and ratings of all component parts or assemblies.

1.6.1.2 Electrical Connection Diagrams

Electrical connection diagrams shall depict external electrical connections provided by Seller. Diagrams shall include all connections, schematics, interfaces and wire specifications for all wiring to be supplied by Seller. Ratings (in both kVA and HP) for the fully-installed filter system shall also be supplied.

1.6.2 Technical Data

1.6.2.1 Design Calculations

An engineering design analysis shall be submitted. This analysis shall be complete with supporting calculations used to establish connected horsepower requirements, shaft sizes, pressure drop calculations, nozzle loading and operating characteristics for the filter system. Calculations shall be complete and in sufficient detail to permit a second party review.

1.6.2.2 Descriptive Literature

Descriptive literature shall be supplied. This shall include equipment ratings, operating characteristics and technical descriptions.

1.6.2.3 Data Sheets

A. Seller shall complete Data Sheet DS-1 Sheets 1 and 2 (Attachment A) and submit for the furnished equipment.

B. Complete ISA S20 specification forms for process measurements and control instruments, primary elements and control valves.

1.6.2.4 Performance curves shall be provided for the centrifugal pumps supplied in the system. These curves shall include brake horsepower, efficiency and applicable corrective factors.

1.6.2.5 Factory Acceptance Tests (FATs) as defined in Paragraph 2.2.9.

1.6.3 Spare Parts List

A list of recommended spare parts for one (1) year's routine operation shall be supplied. The spare parts list shall include sufficient data to permit procurement from the original manufacturer or any subsupplier.

1.6.4 Installation, Operation and Maintenance Manuals

Installation, operation, and maintenance manuals covering the particulate filter furnished in accordance with this specification section shall be provided. Manuals shall fully detail sequences of disassembly, repair, adjusting, reassembly and troubleshooting. Troubleshooting sections shall include fault trees to guide both mechanical and electrical diagnostics. Reduced size copies of any assembly drawings, subassembly drawings and parts lists needed for routine maintenance and overhaul shall be included. Data to be submitted in accordance with Specification Section 01730.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1)	Maximum Design Temperature	110°F
2)	Minimum Design Temperature	-20°F
3)	Wet Bulb Design Temperature	68°F

1.8.2 Operating Environment

1)	Normal Temperature	60°F to 104°F
2)	Maximum Temperature	104°F
3)	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General Requirements

The particulate filter-ion exchanger unit system (Pall Process Filtration Company, Power Generation Group, Model P/N 7BWE70001-40 SIMPLEX or equal) shall be designed to remove both ionic and particulate contaminants from the steam condensate flow. It combines the capabilities of ion exchanger resin and filter elements. Precoat and backwash capability shall be integral to the system. The particulate filter-ion exchanger unit shall be designed to draw a resin slurry from a holding tank and pump it to a filter housing. This housing contains septa elements. The septa element shall be precoated with the ion exchanger resin to act both as a filter and a demineralizer. The precoating operation shall be even and uniform and must maintain this uniformity under increasing differential pressure. The full flow of the condensate shall be maintained until ion exhaustion.

A backwash capability shall be provided to dispense the spent resin to a holding tank. The system shall then be completely cleaned by the reverse pumping of deionized water stored in the deionized water tank.

2.1.2 The particulate filter-ion exchange unit shall consist of the following:

A. Filter housing. This shall be made of Type 304L stainless steel in accordance both with ASTM A480/A480M and ASTM A403/A403M.

B. Precoat system. This shall be composed of a resin slurry tank, a precoat pump, a recirculation tank and a recirculation pump. The tanks shall be Type 304L stainless steel in accordance both with ASTM A480/A480M and ASTM A403/A403M. The tanks shall be built in accordance with ASME Section VIII Division 1. The pumps shall be in accordance with Specification Section 15641.

C. Backwash system. This shall be composed of an air receiver, a deionized water tank and a backwash pump. The tanks shall be Type 304L stainless steel in accordance both with ASTM A480/A480M and ASTM A403/A403M. The pump shall be in accordance with Specification Section 15641.

D. All system piping shall be in accordance with ANSI B1.20.1, ANSI B16.5 and ANSI B31.3.

E. All electric motors shall be TEFC and in accordance with Specification Section 16150.

F. Flexible hoses shall be braided stainless steel Type 304L with 2" raised face weld neck flanges rated 300 lbs. in accordance with ASTM A403/A403M.

2.1.3 Design Envelope

The maximum equipment envelope is:

Length - 6 feet, 0 inches
Width - 2 feet, 6 inches
Height - 6 feet, 0 inches

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 The particulate filter/ion exchanger unit shall be manufactured to operate at peak efficiency with minimal pressure drop. The tanks and filter vessel shall be in accordance with ASME Section VIII, Division 1. A code stamp shall not be required. The vessels shall also be in accordance with Specification Sections 05063 and 13433.

2.2.2 The centrifugal pumps supplied with the system shall be in accordance with Specification Section 15641. These pumps shall operate within 10 percent of their peak efficiency.

2.2.3 The centrifugal pumps shall be directly coupled to electric induction motors furnished in accordance with Specification Section 16150. Flexible couplings shall be used.

2.2.4 The particulate filter/ion exchange unit shall be skid-mounted to enable movement to other locations as necessary. It shall also be adapted with flexible hose connections as described in Paragraph 2.1.2.F.

2.2.5 All rotating parts of the assembled unit shall operate without vibration or thrust. The noise level shall not exceed 85dB at 3 feet peripheral around the filter assembly system.

2.2.6 The drivers shall be electric motors furnished in accordance with Specification Section 16150. The filter system controller shall be completely assembled, wired and tested by Seller before shipment. Electrical supply for motors 1/2 HP or greater shall be 480 volt, 3 phase, 60 Hz. Electrical supply for motors less than 1/2 HP shall be 120 volt, single phase, 60 Hz. Where applicable, component nameplates shall indicate service. The controller supplied for the system shall be in accordance both with NEMA ICS#6 and NEMA 250. All electrical items and assemblies shall be in accordance with NFPA 70.

2.2.7 Guards shall be provided on all exposed moving parts. Guards shall be in accordance with OSHA 1.12.14.

2.2.8 Welding

All particulate filter/ion exchange unit assembly welding requirements for pressure containing components shall be in accordance with Specification Section 05063. All other welding shall be in accordance with AWS D1.1.

2.2.9 Factory Acceptance Tests (FATs)

Seller shall shop-test the particulate filter/ion exchange unit to verify performance. FAT reports shall indicate conformance to the basic parameters used in the design. Buyer shall be notified of the date when FATs are to be scheduled in order for witnessing the testing if desired.

2.3 **LABELING**

The particulate filter/ion exchange unit shall be supplied with permanently-affixed tags. The tags shall be of stainless steel. They shall contain the equipment service name as shown on Data Sheet DS-1 (Attachment A). These tags are in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plates shall be of corrosion-resistant metal. They shall be permanently attached to the equipment with stainless steel screws. Identification plates shall be stamped or embossed with not less than the following information expressed in specified units:

Manufacturer's Name

Equipment serial number
Equipment size and type
Pumping head (for pumps)
Specific gravity of liquid flowing
Pump speed in RPM (for pumps)
Maximum allowable working pressure at maximum design temperature for each component

An arrow shall indicate the pump direction of rotation. This arrow shall be located on the drive end of the pump. It shall be integrally-cast or otherwise permanently attached.

2.4 PACKAGING

2.4.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.4.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.4.3 Flanged openings shall be covered with wood or plastic protectors. Protectors shall be installed with not less than four (4) full diameter steel bolts and nuts.

2.4.4 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.5 Equipment assemblies shall be shipped fully assembled on their baseplates.

2.4.6 The Controllers shall be shipped separately. They shall be field-wired to the equipment from the remote location.

2.4.7 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.8 Separated or loose parts shall be completely boxed. The box shall be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

2.5 COATINGS

After completion of all fabrication procedures the external surfaces of each pump shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC-SP 6. Manufacturer's standard prime and finish paint or coatings shall be applied. Stainless steel surfaces shall not be painted unless specified otherwise.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ELEMENT FILTERS

NO	BY DATE	REVISION
02	3/19/92 RJB	
03		

SHEET NO. D61-SH 1 OF 2 | REV. 01
DATE 09-27-91 | CONTRACT 845724
TAG NO. FL-430-002V
SPECIFICATION SECT NO. 15897
FOR CLIENT USE
ORIG SSLEE | CHK'D PRA | APPR'D

TITLE PARTICULATE FILTER - ION EXCHANGE UNIT
NO UNITS REQ'D 1 NO UNITS OPERATING 1 SPARE 0 TYPE (HORIZONTAL ___) (VERTICAL X)
TYPE ELEMENT (THROW - AWAY X) (CLEANABLE ___) OTHER ___

PROCESS DESIGN

NAME OF FLUID FILTERED CONDENSATE
QUANTITY FLUID FILTERED 60 GPM
OPERATING PRESSURE 200 PSIG
OPERATING TEMPERATURE 125 °F °F
SPECIFIC GRAVITY @ OPER TEMP 0.99 LB / FT ^{3}
VISCOSITY @ OPER TEMP C_p
ALLOWABLE DIRTY PRESSURE DROP PSI
NAME OF PARTICLES REMOVED RADIOACTIVE PARTICULATE
MAXIMUM PARTICLE SIZE MICRON
MINIMUM PARTICLE SIZE MICRON
SIZE OF PARTICLES REMOVED 5-10 MICRON
QUANTITY PARTICLES TO BE REMOVED # / HR

MECHANICAL DESIGN

DESIGN PRESSURE 200 PSIG DESIGN TEMPERATURE 125 °F CORROSION ALLOWANCE ___
CODES: ASME (YES X) (NO ___) STAMP (YES X) (NO ___) OTHER ___

MATERIALS OF CONSTRUCTION		• CONNECTIONS	NO	SIZE	RATING
FILTER CASE	304L STAINLESS	INLET		2"	
FILTER COVER		OUTLET		2"	
FILTER ELEMENT SUPPORTS		VENT			
FILTER CASE SUPPORTS		DRAIN			
FILTER CONNECTIONS		INSTRUMENTS			
ELEMENTS					
GASKETS					

• ALL CONNECTIONS 2 " AND LARGER SHALL BE FLANGED

FILTER COVER TYPE (THRU BOLTED-ON, SWING BOLTED-ON, CLAMP-ON, SCREWED, SPECIAL - SEE NOTES)
DAVIT (YES ___) (NO ___): FILTER CASE SUPPORTS (YES ___) (NO ___) MINIMUM HEIGHT ___
SANDBLAST (YES ___) (NO ___): PAINT PRIMER (YES ___) (NO ___) ___

DATA BY VENDORS

MFR ___ TYPE NO ___
NO REQ'D ___ : NO OPERATING ___ : NO SPARE ___
NO ELEMENTS EACH FILTER ___ : SIZE ___ " O.D. ___ x ___ "STR: MATERIAL ___
TOTAL ELEMENT DIRT HOLDING CAPACITY ___ CU FT : ___ SURFACE ___ SQ FT
CLEAN PRESSURE DROP ___ PSI: SHIPPING WEIGHT ___
DESCRIBE METHOD OF REMOVING ELEMENTS: ___

IS DIMENSIONAL OUTLINE INCLUDED (YES ___) (NO ___) IS FILTER IN ACCORD WITH SPECS (YES ___) (NO ___)

NOTES: (1) FILTERS BID SHALL INCLUDE INITIAL SET OF FILTERING ELEMENTS.
(2) MAXIMUM RADIATION LEVEL SHALL BE 1 REM / HR.

SAFETY CLASSIFICATION 3
IMPACT LEVEL ___

HWVP1B.PRM 07/07/92 FL430.PL 07/07/92 SAR

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

PARTICULATE FILTERION EXCHANGE UNIT

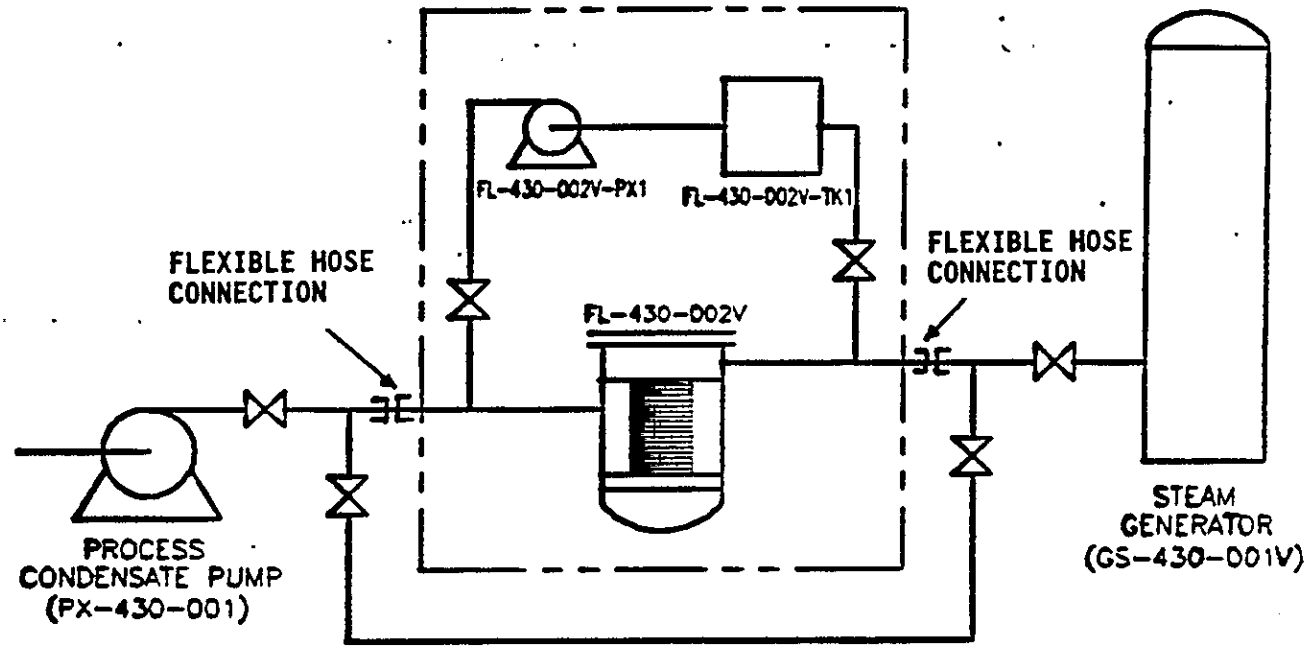
NO	BY / DATE	REVISION

SHEET NO. D61 - SH 2 OF 2	REV. 01
DATE 03-06-90	CONTRACT 845734
TAG NO. FL-430-002V	
SPECIFICATION SECT NO. 15897	
FOR CLIENT USE	
ORIG SSI / CHK'D PJS / APPR'D	

CLIENT US DOE / HWVP

VENDOR

VENDOR PACKAGE
FL-430-002V



DESIGN CONDITIONS

FLUID: *CONDENSATE*
PRESSURE: *200 PSIG*
TEMPERATURE: *125 °F*
FLOW: *60 GPM*

THE VENDOR PACKAGE WILL PROVIDE:

POLYPROPYLENE DEPTH FILTER ELEMENTS
HOUSING
RESIN MAKE - UP / MINIMUM FLOW TANK
PRECOAT / MINIMUM FLOW PUMP

TYPICAL

SAFETY CLASSIFICATION 3
QUALITY LEVEL 3

HWVP30 07/09/92 SAR SSI1.FIL_REC.1 07/09/92 SAR

P33A - 15897

9312975.0439

SECTION 16150
MOTORS - INDUCTION

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for standard induction motors for horizontal drive applications.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA 9	1990 Load Ratings and Fatigue Life for Ball Bearings
AFBMA 11	1990 Load Ratings and Fatigue Life of Roller Bearings

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE 43	1974 Recommended Practice for Testing Insulation Resistance of Rotating Machinery
IEEE 112	1984 Standard Test Procedure for Polyphase Induction Motors and Generators

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG1	1987 (Rev 89) Motors and Generators
NEMA MG2	1983 Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors
NEMA MG13	1984 Frame Assignments for Alternating Current Integral-Horsepower Induction Motors

STEEL STRUCTURE PAINTING COUNCIL (SSPC)

SSPC-SP 6	1989 Surface Preparation Specification No. 6, Commercial Blast Cleaning

1.3 **RELATED REQUIREMENTS**

Specification Section 01730 Operation and Maintenance Data

1.4 **DEFINITIONS**

TEFC - Totally Enclosed Fan Cooled

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Speed/torque and speed/current curves.

1.6.2 Seller shall complete Data Sheet DS-1 (Attachment A) and submit for furnished equipment. Insulation resistance readings for the electric motors shall be completed by Seller (Attachment B).

1.6.3 Motor outline drawings, shaft dimensions and weight.

1.6.4 Detail drawings of main and/or auxiliary junction boxes.

1.6.5 A list of manufacturer's recommended spare parts for one (1) year's routine operation. Sufficient data to permit procurement from the original manufacturer or any subsupplier shall be included.

1.6.6 Operation and maintenance data shall be provided in accordance with Specification Section 01730.

1.6.7 Motor test data in accordance with Paragraph 2.6.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

2) Minimum Design Temperature -20°F

3) Wet Bulb Design Temperature 68°F

D. Operating Environment

1) Normal Temperature 60°F to 104°F

2) Maximum Temperature 104°F

3) Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The following requirements apply to all electrical motors furnished in accordance with this specification section. Special electric motor requirements established by the driven equipment specifications and/or Contract Drawings shall take precedence over this specification section.

GENERAL REQUIREMENTS

Electric motors and motor accessories furnished in accordance with this specification section shall be in accordance with NEMA MG1, NEMA MG2 and NEMA MG13.

A. Motor Rating

Seller shall be fully responsible for specifying electric motor horsepower, speed and torque characteristics for each motor furnished as part of Seller's driven equipment package.

B. Electrical Power Supply

Motors 1/2 HP and larger furnished in accordance with this specification shall be designed for 480V/3 Phase/60 Hz power supply. Motors smaller than 1/2 HP furnished in accordance with this specification section shall be designed for 120V/1 Phase/60 Hz power supply. All motors shall be designed for full voltage across the line starting and rated for continuous duty. The main power junction box shall be large enough to accommodate oversized incoming power conductors and conductors for externally-mounted power factor correction capacitors. Power junction box shall be rotatable by 90° in each direction.

C. Grounding

Each electric motor shall include provisions for motor frame grounding. The ground shall utilize a hex head bolt tapped into the motor frame from within the main junction box.

D. Space Heaters

1) Electric motor space heaters shall not be provided unless otherwise specified by the driven equipment specifications and/or Contract Drawings.

2) When driven equipment specifications and/or Contract Drawings establish the requirement for electric motor space heaters, they shall operate from 120V/1 Ph/60 HZ power supply with a maximum sheath temperature of 392°F. Space heater electrical leads shall be brought out to a separate junction box mounted to the motor on the opposite side from the main junction box.

E. Elastomers

For standard electric motors, elastomer seals and gaskets shall be compatible with the motor application and/or operating environment in accordance either with the driven equipment specifications or Contract Drawings.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Electrical motors furnished in accordance with this specification section shall be in accordance with NEMA MG1, Normal Starting Torque, Low Slip, Electrical Type A, Design B, for polyphase motors with cast iron or fabricated carbon steel motor frames.

A. Service Factor

Electric motors shall be designed and selected with a service factor of 1.15 for polyphase motors and 1.25 for single-phase motors unless otherwise established by the driven equipment specifications and/or Contract Drawings.

B. High-efficiency motors shall be used for motors of 5 HP and larger.

C. Power factor correction capacitors shall be provided for motors of 20 HP or larger to improve the power factor at the motor terminals to 95 percent when the motor is at 3/4 load.

D. Insulation

Insulation systems for motors on general services shall be Class F or better in accordance both with NEMA MG1 and NEMA MG2. Motor leads shall be copper with compression lugs, both sized for 125 percent load current at motor cooling air discharge temperature.

E. Temperature Rise

Temperature rise in accordance with NEMA MG2 shall not be greater than Class F, 330°F rise above a maximum 104°F ambient temperature.

F. Enclosure

Enclosure shall be totally enclosed fan cooled (TEFC).

G. Seals

Motors shall be equipped with suitable shaft seals. The seals shall prevent moisture, dirt and corrosive agents from entering the motor enclosure and bearings along the shaft.

2.2.2 Bearings

A. General service motors shall be furnished with bearing housings designed for re-lubrication of anti-friction bearings, with provisions for flushing out the old lubricant as new lubricant is added.

B. Antifriction bearings shall be in accordance with AFBMA Standards 9 and 11. Each electric motor nameplate shall show the data required by NEMA MG1 and include both front and rear AFBMA bearing part numbers.

C. Ball bearings and roller bearings shall be designed and constructed for 100,000 continuous hours, L-10 minimum life in the specified service in accordance with AFBMA Standards 9 and 11. The design shall be based on continuous operation.

D. Extended bearing life periods, when required, shall be in accordance either with the driven equipment specifications and/or Contract Drawings.

2.2.3 Balancing and Vibration Criteria

A. Motors shall be dynamically balanced. Welding or soldering to effect balancing is unacceptable. Parent metal shall be removed to improve balance without affecting the structural strength of the rotating element.

B. Maximum vibration amplitude (peak to peak) as measured on the rotor shaft shall not exceed 0.001 inches for 3,600 rpm motors, 0.0015 inches for 1,800 rpm motors, 0.002 inches for 1,200 rpm motors and 0.0025 inches for 900 rpm and slower motors. For vibration amplitude measurements, motors shall be operated at rated operating speed and frequency with a one-half key installed in the key seat. Motors shall be mounted on isolators during vibration amplitude measurements in accordance with NEMA MG1.

2.3 LABELING

The electric motor shall be supplied with a permanently-affixed tag. The tag shall be of stainless steel. It shall contain the equipment service name as shown on Data Sheet DS-1 (Attachment A). This tag is in addition to the manufacturer's identification plate (see below).

The manufacturer's identification plate shall be of corrosion-resistant metal. It shall be permanently attached to the equipment with stainless steel screws. The identification plate shall be stamped or embossed with not less than the following information expressed in specified units:

Manufacturer's name
Motor serial number
Motor size and type
Motor rated capacity (in HP and KV)
Motor speed (in RPM)
Wiring alternatives (delta or wye)
Motor weight

2.4 **PACKAGING**

2.4.1 Preparation for shipment and packing shall be in accordance with Seller's standards. At minimum, they shall provide protection against corrosion and damage during normal handling, shipping and storage. Minimum preparation shall include the requirements listed below.

2.4.2 Machined surfaces, threads, bearings and bearing housings shall be protected during shipment by application of grease or other suitable rust-inhibiting compound.

2.4.3 Threaded connections and tapped holes shall be capped or plugged. Compatible materials shall be used to prevent thread damage.

2.4.4 Motor shall be fully protected against moisture penetration to the electrical compartments and winding.

2.4.5 Bracing, supports and rigging connections shall be provided to prevent damage during shipment, lifting and unloading.

2.4.6 Separate or loose parts shall be completely boxed. The box shall then be attached to the main item to be shipped as a unit.

All shipping boxes shall be identified by the Seller's order number, equipment number and equipment description. This identification shall be marked on no less than two adjacent surfaces. The lettering/numbering shall be no less than 2 inches in height. Ink, paint or other indelible material shall be used for marking.

2.4.7 One complete set of installation, operating and maintenance instructions shall be packed with each assembly.

2.4.8 Delivery, Storage and Handling

2.4.8.1 All equipment shall be delivered in the manufacturer's original, unopened protective packaging.

2.4.8.2 The equipment shall be stored and handled in such a manner as to keep it clean and free from damage and/or deterioration.

2.5 **COATINGS**

After completion of all fabrication procedures the external surfaces of each electric motor shall be thoroughly cleaned of all foreign material, including rust, in accordance with SSPC-SP 6. Manufacturer's standard prime and finish paint or coatings shall be applied. Unless specified otherwise stainless steel, nickel,

brass, copper, monel, aluminum, hastelloy, lead, galvanized steel, plastics, elastomers and glass surfaces shall not be painted.

2.6 TESTING

2.6.1 Source Testing

2.6.1.1 Motor Manufacturer Tests

Each electric motor furnished in accordance with this specification section shall be tested by the motor manufacturer prior to shipment. These tests shall include, but shall not be limited to, High-Potential Tests in accordance with NEMA MG1, Part 3 and Routine Tests in accordance with IEEE Standard 112. Seller shall submit motor manufacturer's certified copies of all motor test results.

2.6.1.2 Resistance Tests

Seller shall subject all electric motors furnished in accordance with this specification section to insulation resistance tests in accordance with IEEE Standard 43. Insulation resistance measured during these tests shall not be less than 5 megohms. Seller shall submit completed copies of Attachment B for each electric motor furnished.

2.6.1.3 Performance Test

All required electric motor performance tests shall be conducted in accordance with the applicable driven equipment specification. Performance testing, herein defined as those additional tests referenced in Section 3 of IEEE Standard 112, is not within the scope of this specification section.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FLUOR DANIEL

U. S. Department of Energy
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

ELECTRIC MOTORS

NO.	BY / DATE	REVISION
1		
2		
3		
4		
5		
6		

SHEET NO. DS1 - SH 1 OF 1 | REV.
DATE | CONTRACT 845724
TAG NO.
SPECIFICATION SECT NO. 16150
FOR CLIENT USE
ORIG | CHK'D | APPR'D

ALL ITEMS SHALL COMPLY WITH GENERAL SPECIFICATION SHEETS:

Motor Tag Number(s)								
Manufacture / Serial No.	/	/	/	/	/	/	/	/
Power Rating KW / HP	/	/	/	/	/	/	/	/
Service Factor								
Speed Synch. / Full Load, RPM	/	/	/	/	/	/	/	/
Bearing Type								
BEARING LUBRICATION								
Voltage, Phase, Frequency								
Full Load Current AMP								
Locked Rotor Current 100%V / 80%V	/	/	/	/	/	/	/	/
Acceleration Time (Incl Load) 100%V / 80%V	/	/	/	/	/	/	/	/
Locked Rotor Stall Time (Cold), Seconds								
Locked Rotor Stall Time (Hot) 100%V /80%V	/	/	/	/	/	/	/	/
Locked Rotor Torque (% FL)								
Breakdown Torque (% FL)								
Efficiency A. Full Load								
B. 3/4 Load								
C. 1/2 Load								
Power Factor A. Full Load								
B. 3/4 Load								
C. 1/2 Load								
D. Looked Rotar								
Sound Pressure Level at 1 / Meter in DBA								
Space Heaters Volts /Phase / Watts	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
Rotation (Facing End Oppoit Drive Shaft)								
Insulation								
Enclosure Type / Motor Mounting (H or V) TEFC	/	/	/	/	/	/	/	/
Frame								
Net Weight Kg / LBS	/	/	/	/	/	/	/	/

REV: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

REVISION

REV	ORIG BY	CHCKD. BY	DESCRIPTION
1			
2			
3			
4			

SEEM.FRM 07/07/92 FILE: J7.6IL.REC.1 07/07/92 SAR

ATTACHMENT B

INSULATION RESISTANCE READINGS
ROTATING ELECTRICAL EQUIPMENT

Description _____ Area _____

Test Equipment _____ Ref. ____ Rev. No. _____

Calibration Date _____ Ref. Spec/Section _____

EQUIPMENT NO.	ENVIRONMENTAL CONDITIONS		INSUL. RESIST. Ø-GRD. [Megohms]	TEST VOLTAGE [Megohms]	VISUAL CHECK
	AMBIENT TEMP [°C]	RELATIVE HUMIDITY			

SELLER'S REPRESENTATIVE _____ DATE _____

SECTION 16610
ELECTRICAL REQUIREMENTS FOR ELECTRIC STEAM GENERATOR

PART 1 GENERAL

1.1 SUMMARY

This specification describes the electrical power systems requirements for the design, fabrication, inspection and testing of the Electric Steam Generator.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	1985 (Rev. 88) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 4	1983 (Rev. 88) Terminal Blocks for Industrial Use

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electrical Code (NEC)

UNDERWRITERS LABORATORIES (UL)

UL 1242	1983 Intermediate Metal Conduit
UL 360	1986 Liquid-Tight Flexible Steel Conduit
UL 486A	1991 Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 514B	1989 Fittings for Conduit and Outlet Boxes
UL 1059	1988 Terminal Blocks

1.3 **RELATED REQUIREMENTS**

Specification Section 15620	Electric Steam Generator
Specification Section 17870	Electric Steam Generator Control Panel
Specification Section 01730	Operation and Maintenance Data

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

1.5.1 The Electric Steam Generator shall be suitable for 13.8 kV, 3 phase, 4 wire plus ground, 60 Hz service. Two additional ground lugs shall be provided on steam generator shell for connection to building ground.

1.5.2 Motors, 1/2 Hp and larger, shall be suitable for 480 V, 3 phase, 3 wire plus ground, 60 Hz service.

1.5.3 Electric heaters, 2kW and larger, shall be suitable for 480V, 3 phase, 3 wire plus ground, 60 Hz service.

1.5.4 480 volt, 3 phase power supply, motor starters and contactors required for equipment associated with the Electric Steam Generator shall be supplied by the Buyer.

1.5.5 For control signals, refer to Specification Section 17870, Electric Steam Generator System Control Panel. These control signals shall be from the Buyer's 13.8 kV switchgear, the motor control center and the Seller's control panel.

1.5.6 Each motor starter supplied by the Buyer shall be equipped with two normally open (N.O.) and two normally closed (N.C.) auxiliary contact to provide starter position indication to the control panel.

1.5.7 Motor control circuit shall be 120 Vac. The signal shall be provided from the Buyer's motor starter.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract:

1.6.1 Dimensional outline and/or general arrangement drawings.

1.6.2 Elementary diagrams for all circuits. Connection diagrams for all electrical equipment. Diagrams shall include equipment ID numbers, terminal block location and identification and wire numbers.

1.6.3 Bill of material to include the name of the manufacturer and catalog number of all electrical devices.

1.6.4 Receiving, storage and handling instructions to include inspection and checkout tests.

1.6.5 Operation and maintenance manual in accordance with Specification Section 01730, Operation and Maintenance Data.

1.6.6 Installation Instructions.

1.6.7 Certified Test Reports for the tests performed in Paragraph 2.2.

1.6.8 Interlock Type, and Key Serial Number.

1.6.9 Factory and field electrical test procedures for the 13.8 kV portions of the Electric Steam Generator.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation		714 feet above sea level
B.	Barometric Pressure		14.3 psia
C.	Outside Design Temperature		
	1)	Maximum Design Temperature	110°F
	2)	Minimum Design Temperature	-20°F
	3)	Wet Bulb Temperature	68°F

1.8.2 Operating Environment

A.	Normal Temperature	60°F to 104°F
B.	Maximum Temperature	104°F
C.	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General

2.1.1.1 Electrical components and materials shall be in accordance with the National Electrical Code (NFPA 70). When applicable, all electrical materials and equipment shall be listed by Underwriter's Laboratories and shall bear the UL label.

2.1.1.2 When two or more components of the same specifications are required, the components shall be identical (same manufacturer and catalog number).

2.1.2 13.8 kV Termination Enclosure

2.1.2.1 Provide a NEMA 4X junction box in accordance with NEMA 250 at the conduit entrance to the 13.8 kV termination enclosure. The junction box shall be equipped with the following:

A. One (1) current transformer (CT), window type and with a 100:5 ratio. Square D No. 140R-101 or equal.

B. A short circuiting type terminal block, for CT leads connection.

C. The main power feeders to the steam generator will be (4) 750 kcmil and (1) #1/0 AWG, 15 kV, MV-90 cables, installed in a 5 inch rigid steel conduit. The four (4) 750 kcmil cables will pass through the window type CT.

D. The junction box shall be sized per NEC Section 370-18. The junction box shall provide permanent ground continuity between the steam generator tank and the conduit.

2.1.2.2 High voltage terminators at the steam generator shall be suitable for terminating one (1) 750 kcmil shield cable per phase and neutral. A ground lug shall be supplied for terminating #1/0 AWG ground cable.

2.1.3 Interlocking

2.1.3.1 A Key Type Interlock, Kirk key or equal, shall be furnished on the high voltage termination enclosure to interlock with Buyer's feeder breaker. Interlocking shall be performed using one key and shall be as follows:

A. At the Steam Generator:

- Termination enclosure at the steam generator is open, the key can not be removed unless the enclosure is closed and locked.

- Termination enclosure is closed and can not be opened unless Buyer's feeder breaker is tripped open, racked out and locked. The key is then removed from the breaker and inserted in the steam generator termination enclosure to open.

B. At the Buyer's Feeder Breaker:

- The feeder breaker cannot be closed unless the steam generator termination enclosure is closed and the key is removed and inserted in the feeder breaker.

2.1.4 Terminal Blocks

Terminal blocks shall be provided and mounted in all junction boxes and panels with each containing 20 percent spare terminals (minimum 2). Terminal blocks shall be rated 600 volts with screw type terminals on both sides. Terminal blocks shall be in accordance with NEMA ICS4 and UL 1059. Allen Bradley catalog Number 1492-CD3 or equal.

2.1.5 Conduit

2.1.5.1 Conduit shall be intermediate hot dipped galvanized steel in accordance with UL 1242. Minimum conduit size shall be 3/4 inch.

2.1.5.2 Liquid-Tight Flexible Metal Conduit

Liquid-tight flexible metal conduit shall be fabricated of galvanized steel flexible tubing with a synthetic polyvinyl chloride (PVC) jacket extruded over the tubing. Jacket shall be positively locked to the steel tubing to prevent sleeving. Liquid-tight flexible metal conduit shall be in accordance with UL 360.

2.1.5.3 Flexible connections shall be three feet or shorter, of the same size as the feeder conduit and installed per the requirements of NEC.

2.1.6 Wire

2.1.6.1 Wires shall be single conductor, stranded copper with 600 volt insulation. Conductors shall be UL listed type XHHW or THWN/THHN

in accordance with the National Electrical Code, NFPA 70, (Article 310).

2.1.6.2 Conductors for power and lighting circuits shall not be smaller than No. 12 AWG.

2.1.6.3 Instrumentation cables shall be UL listed, twisted, shielded pair or triad, No. 16 AWG, stranded copper, with a copper drain wire, 300 volt rated PVC insulation and overall PVC jacket.

2.1.6.4 Thermocouple cables shall be UL listed, twisted, shielded pair, No. 16 AWG, solid conductors, with a copper drain wire, 300 volt rated PVC insulation and overall PVC jacket. Conductor material shall be the same as the thermocouple to which it is connected.

2.1.7 Copper Conductor Termination

2.1.7.1 Termination of #10 AWG conductors and smaller shall be made with tin plated, copper compression ring tongue, nylon, self-insulated terminals. Terminals shall be in accordance with UL 486A. Thomas and Betts Catalog No. RA (#22-18 AWG), RB (#16-14 AWG), RC (#12-10) or equal.

2.1.7.2 Terminations of conductors No. 8 AWG and larger shall be made with long barrel copper compression connectors. Connectors shall be in accordance with UL 486A. Thomas and Betts Series Number 54900 (#8 - #4 AWG) or equal.

2.1.7.3 Termination of instrument pigtail leads and splicing of control and ground wires shall be made with insulated pressure connectors inside fittings or J-boxes. Thomas and Betts "Sta-Kon" or equal.

2.1.8 Identification

2.1.8.1 Wire and Cable

2.1.8.2 Conductors shall be identified at each end. Identification of conductors shall be by means of heat shrinkable insulated tubing with conductor identification by heat impressed black on white characters, Thomas and Betts Catalog No. WHT-700 or approved equal. Identification inscription shall be by individual and distinctive numbers for each conductor (i.e., 1., 2., 3., 4...)

2.1.9 Conduit Fittings

2.1.9.1 Cast malleable iron or steel conduit fittings used with intermediate steel conduit shall be thoroughly coated with metallic galvanize or cadmium inside and outside after all machine work is completed and in accordance with UL 514B.

2.1.9.2 Fittings used with liquid-tight flexible metal conduit shall be malleable iron/steel construction, plated inside and outside the same as Paragraph 2.1.9.1, furnished with nylon insulated throat, taper threaded hub, and an external ground lug.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Production Tests

2.2.1.1 Production tests shall be performed as required by the applicable ANSI standards. These tests shall be witnessed and accepted by the Buyer during the factory inspection visit if so desired by the Buyer.

2.2.2 Factory Inspection

2.2.2.1 The equipment shall be inspected at the factory to assure compliance with the specifications, standards and codes and any additional requirements listed in this specification.

2.2.2.2 Inspection shall include, but not necessarily be limited to, the following items:

2.2.2.2.1 Wire and Cable Tests

Continuity Test

A. Test for continuity, correctness of wiring and verify correct identification on all conductors installed.

B. Test shall be made with an ohmmeter.

C. Ground continuity test shall be performed between the equipment ground bus and the equipment enclosure. The maximum acceptable resistance shall be 0.01 ohm.

2.2.2.2.2 Insulation Resistance Test

A. All conductors shall be given an insulation resistance test using a megohmmeter.

B. Test shall be made with the lugs in place and conductors disconnected at the equipment. Test shall be made between one conductor and ground with the other conductors grounded. Each conductor shall be tested in the same manner. The voltage shall be applied and readings taken every minute until three equal and consecutive readings are obtained.

C. Disconnected wires shall be safety tagged. Disconnect devices (circuit breakers, switches, etc.) will be safety tagged and locked open.

D. Test voltages and minimum acceptable insulation resistance shall be as follows:

Insulation Voltage	Test Voltage	Min. Insulation Resistance
300 volt ac	500 Vdc	10 megohms
600 volt ac	1000 Vdc	10 megohms

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 17870
ELECTRIC STEAM GENERATOR SYSTEM CONTROL PANEL

PART 1 GENERAL

1.1 SUMMARY

This section describes requirements for the Electric Steam Generator System Control Panel, Tag Number LP-430-001. Specify non-panel instruments in accordance with Section 17871; the present section shall be to specify panel instruments exclusively.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to by the basic designation only.

DEPARTMENT OF DEFENSE (DOD)

MIL-STD-1472D	1989 Human Engineering Design Criteria for Military Systems, Equipment and Facilities Change Notice; March 20, 1991

ELECTRIC POWER RESEARCH INSTITUTE (EPRI)

NP-3659	1984 Human Factors Guide for Nuclear Power Plant Control Rooms Final Report

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA RP60.6	1984 Nameplates, Labels and Tags for Control Centers
ISA S18.1	1979 Annunciator Sequences and Specifications, Revision 1985
ISA S20	1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

INTERNATIONAL ELECTROTECHNICAL INSTITUTE (IEC)

IEC 946	1989 Design for Control Rooms of Nuclear Power Plants

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA 250	1985 Enclosures for Electrical Equipment (1000 Volts Maximum) Rev No. 1 - May 1986 Rev No. 2 - May 1988
NEMA ICS-6	1988 Enclosures for Industrial Controls and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electrical Code

NUCLEAR REGULATORY COMMISSION (NUREG)

NUREG 0700	1981 Guidelines for Control Room Design Reviews

UNDERWRITERS LABORATORIES INC. (UL)

Directory	1991 Electric Appliance and Utilization Equipment Directory
Directory	1991 Recognized Component Directory
UL 50	1988 Cabinets and Boxes
UL 83	1983 Thermoplastic-Insulated Wires and Cables Tenth Edition; September 25, 1991
UL 1059	1991 Terminal Blocks Second Edition; July 16, 1991

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operations and Maintenance Data
Specification Section 15620	Electric Steam Generator
Specification Section 16610	Electrical Requirements for Electric Steam Generator
Specification Section 17871	Instruments Furnished With Mechanical Equipment, Electric Steam Generator System
Drawing No. H-2-121705	LP-430-001 Instrument Panel Layout

1.4 **DEFINITIONS**

CWP - Circulating Water Pump

DCS - Distributed Control System

DEG F - Degrees Fahrenheit

FAT - Factory Acceptance Test

GPM - Gallons Per Minute

LB/HR - Pounds Per Hour

MAWP - Maximum Allowable Working Pressure (Design Pressure)

MCCT - Motor Control Center Current Transformer

PB - Pushbutton

PLC - Programmable Logic Controller

P&ID - Piping and Instrument Diagram

PSIA - Pounds Per Square Inch Absolute

PSIG - Pounds Per Square Inch Gauge

1.5 **SYSTEM DESCRIPTION**

1.5.1 The Steam Generator System Control Panel shall act as the central control panel for all steam generation activities. The panel shall monitor the operating state and contain all the control logic to supervise and control the operation of the steam generator detailed in Specification Section 15620.

1.5.2 The documents listed below are for information only and will be available from the Buyer upon request.

Drawing No. H-2-123352 Sheet 1	Piping and Instrument Diagram, System 43, Process Steam Generator and Process Steam Distribution
Drawing No. H-2-123352 Sheet 2	Piping and Instrument Diagram, System 43, Process Steam Condensate System

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

Use only the following drawing sizes:

A. 8-1/2 inch by 11 inch

B. 11 inch by 17 inch

C. 28 inch by 40 inch

1.6.1 Catalog cuts describing each instrument and accessories.

1.6.2 Manufacturers' installation drawings and instructions.

1.6.3 Manufacturers' operating, and maintenance manuals in accordance with Specification Section 01730, Operation and Maintenance Data.

1.6.4 Piping and Instrument Diagrams (P&IDs) showing the Seller's system and its interface to the rest of the plant. The Buyer will furnish instrument tag numbers on the approval prints for Seller's instruments not shown on P&ID H-2-123352.

1.6.5 Process Control Description - a narrative describing the system operation, including normal and abnormal conditions, start-up and shutdown. Use the following outline:

TITLE

1.0 GENERAL DESCRIPTION

2.0 OPERATING DESCRIPTION NARRATIVE

2.1 Routine Operations

2.2 Infrequent Normal Operations

2.3 Abnormal Conditions

1.6.6 Instrument data sheets similar to ISA S20, completed in accordance with ISA S20 instructions.

1.6.7 General arrangement drawings, front and rear views, including provisions for anchorage.

1.6.8 Rear view showing internal layout of instruments and accessories.

1.6.9 Electrical elementary diagrams showing devices, power wiring, signal wiring, terminations, and logic.

1.6.10 Panel connection diagram, shown as a not-to-scale expanded rear view with devices and terminal blocks in their correct relative positions, conduit or duct layout, wire routing and termination.

1.6.11 Instrument list showing tag number, service, manufacturer, model number, range and setpoint if applicable.

1.6.12 FAT procedure including requirements in Paragraph 2.3.

1.6.13 Report confirming the inspection/testing procedure was executed and the results, including calibration data.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110° F

2) Minimum Design Temperature -20° F

3) Wet Bulb Design Temperature 68° F

1.8.2 Operating Environment

A. Normal Indoor Temperature 60°F to 104° F

B. Maximum Temperature 104° F

C. Relative Humidity Not controlled

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General

2.1.1.1 Control panel, accessories, materials and instrumentation shall operate under the conditions of Paragraph 1.8.

2.1.1.2 The Seller shall select accessories, materials, and methods of fabrication not included in this specification, but which are necessary to complete the fabrication of control panels.

2.1.1.3 When two or more components of the same specifications are required, the components shall be identical (same manufacturer and catalog number).

2.1.1.4 All electrical components, devices and materials which operate at voltages higher than 30 volts or energy greater than 100 VA shall be UL listed or FM approved devices/UL recognized or FM approved components (refer to the UL or FM Directories).

2.1.2 Panel and Accessories

2.1.2.1 Select a ANSI/NEMA 250, Type 4X, stainless steel enclosure in accordance with UL 50 and NEMA ICS-6 from a manufacturer's catalog for the basic panel structure.

2.1.2.2 Use hardware, including door hinges, handles, locking mechanisms, mounting bolts, nuts, washers, etc., which will not corrode when exposed to the environment used to define NEMA 4X.

2.1.3 Instruments

2.1.3.1 Provide a 4-input strip chart recorder mounted in front of the panel indicating the following:

DISPLAY VARIABLE	INPUT SIGNAL FROM	FIELD INSTRUMENT SUPPLIED BY	DISPLAY UNITS
Feedwater Input Flow	FIT-PRC-019	Buyer	GPM
Output Steam Flow	FIT-PRS-015	Buyer	LB/HR
Steam Generator Pressure	PIT-PRS-008	Seller	PSIG
Steam Temperature	TIT-PRS-016	Buyer	DEG F

Signals to the recorder shall be 4-20mA calibrated linearly proportional to the range of measurement. Provide separate pen colors on each channel and incorporate the color names into the panel nameplate. The recorder shall have an accuracy of +/-0.25 percent full-scale and a repeatability of +/-0.1 percent full-scale. Eleven (11) inch fanfold paper shall be accommodated. A 6 inch vertical length of chart shall be visible through the front-of-panel NEMA 4X window. Provide a recorder having selectable logging speeds, with a normal rate of about one inch per hour.

2.1.3.2 Digital indicating controllers shall be provided to control steam generator electrode load, water level, and steam pressure. Controllers shall have a minimum accuracy of +/-.5 percent of span. Controller input signals shall be 4-20mA calibrated linearly proportional to the range of measurement as follows:

DISPLAY VARIABLE	INPUT SIGNAL FROM	FIELD INSTRUMENT SUPPLIED BY
Electrode Load	Electrode MCCT Transmitter	Buyer
Steam Generator Water Level	LIT-PRS-006	Seller
Steam Generator Pressure	PIT-PRS-008	Seller

2.1.3.3 Provide and install an annunciator cabinet for alarm displays. Annunciator cabinet shall conform to an F2M-1 alarm sequence, as specified in ISA S18.1. Provision shall be made to have remote alarm controls for F2M-1 alarm sequence operations: ACKNOWLEDGE, RESET, SILENCE, and TEST. Display points shall be lighted by two separate lamps in parallel each having a 50,000 hour life. Provide a common trouble alarm dry contact output rated 2A at 120Vac, resistive.

2.1.3.4 Provide a digital loop indicator to display steam generator water conductivity in micro-mhos. The indicator shall have a minimum accuracy of +/-.1 of span +/- 1 digit. The indicator input signal shall be 4-20mA from CIT-430-116, calibrated linearly proportional to the range of input.

2.1.3.5 All pressure, water level, conductivity, and power control functions shall be implemented through panel-mounted instruments and logic supplied by the Seller subject to the approval of the Buyer.

2.1.3.6 Motor, pump, electrode, heater, etc. status indicators shall not be wired directly to control switches. Use feedback for status indications as detailed in Paragraph 1.5 of Section 16610.

2.1.3.7 Provide a test pushbutton to light all status and annunciator lamps.

2.2 **FABRICATION AND MANUFACTURE**

2.2.1 Panel Steel Modifications

2.2.1.1 Modify the panel described in Paragraph 2.1.2.1 as necessary to support the instrumentation and accessories to be mounted in the panel. The panel shall retain its NEMA Type 4X rating after all the modifications have been made.

2.2.1.2 The control panel shall have provisions to be anchored to the elevated platform with a minimum of eight 1/2 inch diameter bolts. Bolt holes shall be 9/16 inch diameter.

2.2.1.3 Conduit entry shall be from the top.

2.2.2 Panel Interior Environment

2.2.2.1 Prevent operating temperature from exceeding instrument/equipment manufacturers' operating limits.

2.2.2.2 Prevent condensation during shipping, storage, and operation.

2.2.3 Painting

Do not paint the panel.

2.2.4 Equipment Mounting

2.2.4.1 Instruments and equipment shall be mounted and supported in accordance with manufacturers' instructions.

2.2.4.2 Layout front-panel instruments in accordance with MIL-STD-1472D, EPRI NP-3659, IEC 964, and NUREG 0700. Drawing H-2-121705 complies with these standards.

2.2.4.3 Adjustments shall be readily accessible. Instruments and components shall be replaceable without disturbing wiring or other equipment.

2.2.5 Panel Piping

There is no piping required on this panel.

2.2.6 Nameplates

2.2.6.1 Make nameplates from 1/16 inch thick laminated plastic stock with white surface and black core except as noted on Drawing Number H-2-121705. Bevel the edges and remove burrs.

2.2.6.2 Engrave with Helvetica Bold Condensed capital letters. Use ISA RP60.6, Appendix B when abbreviations cannot be avoided. Other abbreviations are subject to Buyer's approval.

2.2.6.3 Fasten the nameplates to the panel with stainless steel number 4-40 screws or 1/8 inch drive rivets.

2.2.6.4 Provide 1 inch maximum height nameplate with instrument tag numbers engraved in 1/8 inch high letters on the back of the panel to show the location of front and back of panel mounted instruments.

2.2.6.5 Make front of panel nameplates as shown on Drawing Number H-2-121705.

2.2.7 Panel Wiring

2.2.7.1 Wiring material and installation methods shall comply with NFPA 70, Article 725, Class 1 and Class 2.

2.2.7.2 Use Number 16 AWG stranded copper wire with MTW insulation conforming to UL 83.

2.2.7.3 Terminate wires at both ends with spade type, crimp-on, vinyl insulated lugs.

2.2.7.4 Identify wires at both ends with white tubular shrink-on sleeves with permanently imprinted black characters. Use the same number on both ends of the wire. Use the same number throughout the run of daisy chained wires.

2.2.7.5 Use the instrument tag number and a sequential number for the wire number. Use the same sequential number for the same instrument terminal on similar instruments.

2.2.7.6 Support wiring in raceway or conduit.

2.2.7.7 Provide channel mounted terminal blocks with tubular screws and pressure plates rated 600 volts in compliance with UL 1059. Wire all instruments and devices on the panel to terminal blocks. Select Allen Bradley Catalog Number 1492-HI or equal.

Provide incoming terminal blocks for #12 AWG wires to accommodate control signals from the Buyer's 13.8 kV switchgear and the 480V motor control centers as follows:

A. 6 terminal points for 3 pairs of 4-20mA dc signals to monitor 13.8 kV voltages: Phase A, Phase B and Phase C. These signals will be the output of ac triple voltage transducer connected to 8400-120V Y-Y (grounded neutral) potential transformers.

B. 8 terminal points for 4 pairs of 4-20mA dc signals to monitor 13.8 kV load currents: Phase A, Phase B, Phase C and neutral. These signals will be the output of ac triple current transducers connected to three 600:5 current transformers on Phases A, B and C and one 100:5 current transformer on the neutral.

C. 4 terminal points for trip signals to and from the 13.8 kV power source lockout relay.

D. 8 terminal points for the 13.8 kV power source main breaker control and indication circuits.

E. 12 terminal points for each 120 Vac electrical control and indicating circuit of a motor starter service (for the motor running/not running indicators).

2.2.7.8 Wire blowdown valve status indicators to terminals which will be connected to the buyer supplied limit switches, ZSL-PRC-038 and ZSH-PRC-038.

2.2.7.9 Terminal blocks shall have the greater of 25 percent or two spare terminals for each terminal strip. In addition, the number of spares provided shall be an even number.

2.2.7.10 Provide a copper safety ground bus bolted to the panel frame with screws to connect 8 or more 10-14 AWG ground wires. Provide a similar, but isolated, instrument signal ground bus.

2.2.7.11 Divide the main incoming 120 Vac power by system or function. Install a fused disconnect switch on the line (hot) side of each circuit. Color code the wires as:

Hot - Black
Neutral - White
Ground - Green

2.2.7.12 If power from external systems (such as the control voltage from motor starters) comes into the panel, provide a red nameplate with white letters stating:

CAUTION:
120 VAC CIRCUITS FROM EXTERNAL
SOURCES MAY BE ENERGIZED WHEN
THE PANEL MAIN BREAKER IS OPEN.

2.2.7.13 Install incandescent light fixtures on a separate 120 Vac circuit with an on/off switch to illuminate the entire panel interior.

2.2.7.14 Install a duplex receptacle on a separate 120 Vac circuit to power test equipment.

2.2.7.15 Provide two spare fuses of each type used in the panel. Seal them in a clear plastic bag marked "Spare Fuses" and tie-wrap them to the panel interior.

2.2.8 Logic Design

2.2.8.1 Design control circuits to fail safe on loss of power.

2.2.8.2 Design discrete circuits to operate on 120 Vac; to have contacts closed (powered) during normal operation; and to have contacts open on abnormal conditions to cause alarms and shutdowns.

2.2.8.3 Control Panel Operational Description

Refer to Drawing H-2-121705.

2.2.8.3.1 Provide a 3-position keyswitch for boiler mode control of the steam generator. Label the positions FLUSH, TEST and RUN.

A. Develop logic to implement a flush mode whereby a dilute nitric acid solution shall be flushed through the boiler, through the adjoining steam header system, and redirected by the Buyer into a waste sump. Provide a permissive "flush contact" rated 2A at 120 Vac, resistive, allowing the Buyer to initiate flush with the feedwater inlet pumps. The key shall be captive (not removable from keyhole) in the FLUSH position.

B. Develop logic to implement a test mode to verify the functionality of the load control system (regulating shield, circulating pumps, etc.).

C. Develop logic to implement a run mode to execute normal operation of the boiler when both the BOILER MODE CONTROLS STANDBY/RUN switch and FLUSH/TEST/RUN keyswitch are in the

RUN position. Execution shall be initiated by depressing the START PB.

2.2.8.3.2 Provide a 2-position BOILER MODE CONTROLS switch with RUN and STANDBY positions.

A. Develop logic to implement a standby mode in which the standby heater shall be active.

2.2.8.3.3 Provide a PUSH TO STOP PB to serve as an emergency shutdown. An additional relay contact rated 2A at 120 Vac, resistive, shall be provided as a remote stop which will shut down the steam generator upon deenergization by the Buyer's DCS.

Steam generator shutdown shall result in the following:

A. Turn off main electrode and standby heater power

B. Close feedwater inlet valve

C. Stop circulation pumps

D. Inhibit conductivity control functions (i.e., blowdown and chemical injection)

2.2.8.3.4 Provide mode indicators to display steam generator operating state as described in 2.2.8.3.1-2.2.8.3.3 and depicted in Drawing No. H-2-121705.

2.2.8.3.5 Provide status indicators for all equipment served by motor starters.

2.2.8.3.6 Provide OFF/AUTO/ON controls which function as follows on equipment served by motor starters:

OFF - Controlled function is unconditionally off

AUTO - Controlled function is either on or off in accordance to steam generator demands.

ON - Controlled function is unconditionally on

2.2.8.3.7 Provide automatic switchover controls on all redundant equipment served by motor starters except the circulation pumps:

A. A control switch as in 2.2.8.3.6.

B. A 2 position A/B maintained selector switch to designate active piece of equipment.

C. Logic to switch to the standby equipment when a failure in the active equipment is detected and the switch in 2.2.8.3.7.A is in the AUTO position.

2.2.8.3.8 Provide a HIGH HIGH STEAM PRESS alarm set to shutdown the steam generator at 10 percent below the MAWP of the steam generator when PSHH-PRS-007 trips.

2.2.8.3.9 Provide a HIGH STEAM PRESS alarm set to annunciate at 10 percent above the normal steam pressure (170.5 psig).

2.2.8.3.10 Provide a LOW STEAM PRESS alarm set to annunciate at 10 percent below the normal steam pressure (139.5 psig).

2.2.8.3.11 Provide a HIGH WATER LEVEL alarm set to annunciate at 10 percent below the maximum allowable water level.

2.2.8.3.12 Provide a LOW WATER LEVEL alarm set to annunciate at 10 percent above the minimum allowable water level.

2.2.8.3.13 Provide a HIGH CONDUCTIVITY alarm set to annunciate at 10 percent below the maximum allowable steam generator water conductivity.

2.2.8.3.14 Provide a LOW CONDUCTIVITY alarm set to annunciate at 10 percent above the minimum allowable steam generator water conductivity.

2.2.8.3.15 Provide a LOW CWP DISCHARGE PRESS alarm that shall be initiated by a contact opening on PSL-PRC-032. Include controls (CIRC PMP SELECT, CIRC PMP OPERATION) so that the operator may manually switch to the other circulating water pump.

2.2.8.3.16 Provide a LOW CHEMICAL FEED LEVEL alarm upon a contact opening in LSL-BFA-004.

2.2.8.3.17 An agitator on/off control (AGITATOR CONTROL) shall be provided to control the chemical feed tank agitator.

2.2.9 Interface to other Instrument and Computer Systems

2.2.9.1 Provide terminals in series with the 4-20mA dc signals from the following transmitters for Buyer's connection to his DCS.

TAG NUMBER	PURPOSE	SUPPLIED BY
LIT-PRS-006	Steam Generator Water Level	Seller
PIT-PRS-008	Steam Generator Pressure	Seller
FIT-PRS-015	Output Steam Flow	Buyer
CIT-PRC-031	Steam Generator Water Conductivity	Seller
TIT-PRS-016	Steam Temperature	Buyer
FIT-PRC-019	Feedwater Flow	Buyer

2.3 FACTORY ACCEPTANCE TESTS

2.3.1 Prepare a FAT procedure and submit it for approval. Include:

Inspection/tests to demonstrate that the fabrication and assembly of the materials and equipment meet the requirements of the design drawings and specifications.

2.3.2 Inspect and test the instrument installations according to the Buyer approved FAT procedure.

2.3.3 Submit a report confirming that the FAT has been completed, and the results.

2.4 PACKAGING AND SHIPPING

2.4.1 Reinstall shipping stops which were removed for calibration and testing.

2.4.2 Provide temporary additional shipping supports for instruments and equipment to be shipped mounted in the panel.

2.4.3 Repack loose instruments and equipment, including those removed from the panel for shipment, in the manufacturer's original packing material. Accumulate these in a separate crate marked "INSTRUMENTS" for shipment.

2.4.4 Protect all shipped materials from moisture, vibration, shock, and heat damage while in transit or interim storage. Crates and packages of instruments or components, which have been shipped separately, shall be identified and marked to be traceable back to the main equipment component.

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 17871
INSTRUMENTS FURNISHED WITH MECHANICAL EQUIPMENT
ELECTRIC STEAM GENERATOR SYSTEM

PART 1 GENERAL

1.1 SUMMARY

This section defines the requirements for the supply, installation, inspection and testing of instruments furnished with the Electric Steam Generator GS-430-001V specified in Specification Section 15620. It does not apply to control panels.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME B1.20.1	1983 Pipe Threads, General Purpose (Inch)
ASME/ANSI B16.5	1988 Pipe Flanges and Flanged Fittings; Errata - October 1988
ASME/ANSI B16.10	1986 Face-to-Face and End-to-End Dimensions of Valves
SECTION I	1989 Boiler and Pressure Vessel Codes, Section I, Rules for Construction of Power Boilers

FACTORY MUTUAL (FM)

Directory	1991 Approval Guide

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20	Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA 250	1985 Enclosures for Electrical Equipment (1000 Volts Maximum) Rev No. 1 - May 1986 Rev No. 2 - May 1988

UNDERWRITERS LABORATORIES INC. (UL)

Directory	1991 Electric Appliance and Utilization Equipment Directory
Directory	1991 Recognized Component Directory
UL 429	1982 Electrically Operated Valves

1.3 **RELATED REQUIREMENTS**

Specification Section 01730	Operation and Maintenance Data
Specification Section 15620	Electric Steam Generator
Specification Section 16610	Electrical Requirements for Electric Process Steam Generator
Specification Section 17870	Electric Steam Generator System Control Panel

1.4 **DEFINITIONS**

BPVC - Boiler and Pressure Vessel Code

DCS - Distributed Control System

DEG F - Degrees Fahrenheit

DPDT - Double Pole Double Throw

FAT - Factory Acceptance Tests

MAWP - Maximum Allowable Working Pressure (Design Pressure)

NPT - National Pipe Thread

P&ID - Piping and Instrument Diagram

PSIA - Pounds Per Square Inch Absolute

PSIG - Pounds Per Square Inch Gauge

TFE - Polytetrafluoroethylene (Teflon or Equal)

1.5 **SYSTEM DESCRIPTION**

1.5.1 The system and the Seller's responsibilities for detailed system design are defined in Article 1.5 of Specification Section 17870.

1.5.2 The documents listed below are for information only and will be available from the Buyer upon request.

Drawing No. H-2-123352 Sheet 1	Piping and Instrument Diagram, System 43, Process Steam Generator and Process Steam Distribution
Drawing No. H-2-123352 Sheet 2	Piping and Instrument Diagram, System 43, Process Steam Condensate System

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Catalog cuts describing each instrument and accessory.

1.6.2 Manufacturers' installation drawings and instructions.

1.6.3 Manufacturers' operating and maintenance manuals in accordance with Specification Section 01730.

1.6.4 Instrument data sheets similar to ISA S20, completed in accordance with ISA S20 instructions.

1.6.5 Plan and elevation drawings for Seller-mounted instruments with dimensioned locations for instrument and control devices, connections to the mechanical equipment, air supply connections, and terminal boxes.

1.6.6 Process tubing detail drawings.

1.6.7 Pneumatic tubing detail drawings.

1.6.8 Terminal box layout drawings showing location and identification of terminals, conduit sizes and entrance locations.

1.6.9 Electrical connection diagrams (point to point wiring).

1.6.10 Bills of material for instrumentation.

1.6.11 Instrument sizing calculations and formulae including the name, manufacturer, and serial number of any computer programs used in sizing.

1.6.12 Seller created service descriptions.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
1)	Maximum Design Temperature	110 DEG F
2)	Minimum Design Temperature	-20 DEG F
3)	Wet Bulb Design Temperature	68 DEG F

1.8.2 Operating Environment

A.	Normal Indoor Temperature	60 DEG F to 104 DEG F
B.	Maximum Temperature	104 DEG F
C.	Relative Humidity	Not controlled

PART 2 PRODUCTS

2.1 **MATERIALS/EQUIPMENT**

2.1.1 General

2.1.1.1 Select instrumentation appropriate for the application, including correct range, pressure and temperature rating, and materials of construction to operate under the conditions of Paragraph 1.8.

2.1.1.2 Provide accessories, materials and methods of fabrication not included in this specification, but which are necessary to complete the installation of the instrumentation.

2.1.1.3 When two or more components with the same specifications are required, the components shall be identical (same manufacturer and catalog number).

2.1.1.4 Electrical and electronic instruments, control devices and components which operate at voltages greater than 30 volts or energy greater than 100 VA shall be UL listed devices, UL recognized components, or FM approved devices (refer to UL and FM Directories).

2.1.1.5 Instrument air supply will be available at:

Pressure (Normal)	Temperature (Normal)	Pressure (Design)	Temperature (Design)
80 PSIG	90 DEG F	150 PSIG	150 DEG F

2.1.1.6 Pneumatic signals shall be 3-15 psig.

2.1.1.7 Instrument wetted parts shall be specified not to deteriorate when exposed to the environment used to define NEMA 4X per ANSI/NEMA 250.

2.1.1.8 Instrument electrical enclosures shall be Type 4X.

2.1.1.9 Electronic analog signals shall be 4-20 mAdc.

2.1.1.10 Discrete signals shall be 120 Vac.

2.1.1.11 Instrument screwed connections shall be in accordance with ANSI/ASME B1.20.1.

2.1.1.12 Provide a stainless steel tag, 18 ga. minimum, with the instrument tag number and service description stamped or engraved, permanently affixed to each instrument with stainless steel wire (preferred), stainless steel screws or rivets. Find service descriptions in Attachments A-E or create service descriptions for instruments not found in the attachments using the following guidelines:

A. Maximum of 60 character length

B. General format:

Application; Limit; Variable Name (e.g., Steam Generator High Pressure)

Submit the Seller created service descriptions for Buyer's approval.

2.1.1.13 Specify instruments to operate under the design temperature of the corresponding process fluid. Fluid abbreviations can be obtained by taking the letters in between the first and second hyphen ("-") of the instrument's tag number in attachments A-F. Design temperatures are as follows:

ABBREVIATION	FLUID DESCRIPTION	MAX DESIGN TEMPERATURE
PRC	Process Condensate	390 DEG F
PRS	Process Steam	390 DEG F
BFA	Boiler Feedwater Additives	150 DEG F

2.1.2 Instruments provided by Seller shall include the features listed by instrument type below:

2.1.2.1 Temperature Indicators

A. Bimetallic sensing element

B. Heavy-duty, 304L stainless steel body

C. Viewing angle connection adjustable through 180°

D. 5 inch nominal dial diameter

E. Shatter resistant glass dial window

F. Accuracy of +/- 1.0% of full span

G. 1/2 inch male NPT connections for matching thermowells

2.1.2.2 Thermowells

A. 304L stainless steel body

B. Body machined from single bar stock

C. Wetted surfaces polished to a 4-5 micro inch finish

D. 1-1/2 inch 300# raised face flange process connection

2.1.2.3 Transmitters

A. Onboard microprocessor for calibration and diagnostic information such as sensor failure, circuit board failure, pressure range failure, and temperature range failure.

B. Non-interacting span and zero settings

C. Output driven below 4mAdc or above 20mAdc when a malfunction is detected

D. Two-wire type

E. 2 inch integral indicator

F. Accuracy of +/- 0.5% of span (including linearity and hysteresis)

G. Maximum zero and span drift of 2.5% per 30 DEG F

H. Radio frequency interference from 20 to 1000 MHz with a field strength of 30 Volts per meter shall not affect the output of a transmitter, installed with grounded conduit, by more than +\- 0.1% of span.

I. 304L stainless steel wetted parts

J. 1/2 inch NPT electrical conduit connections

K. 1/2 inch NPT process connections

2.1.2.4 Level Gauges

A. Specified in accordance with ASME BPVC Section I

B. Rated at 1000 psig at 100 DEG F

C. 3/4 inch NPT gauge body connections

D. Matching gauge cocks

2.1.2.5 Gauge Cocks

A. Specified in accordance with ASME BPVC Section I

B. Rated at 3000 psig at 100 DEG F

C. 3/4 inch NPT solid shank tank connections

D. 3/4 inch NPT spherical union gauge connection

E. 304L stainless steel wetted parts

2.1.2.6 Switches

A. DPDT contacts

B. Contacts rated for 2 Amps at 120 Vac through a resistive load

C. 304L stainless steel wetted parts

D. 1/2 inch NPT conduit connections

E. Repeatability 2.0% of full span

2.1.2.7 Control Valves

A. Fail in a safe position as shown on P&ID Drawings H-2-123352, Sheets 1 and 2

B. Flow direction permanently engraved on body

C. 304L stainless steel body

D. Corrosion and abrasion-resistant trim material

E. No asbestos

F. Flanged end connections per ASME/ANSI B16.5

G. End-to-end dimensions per ASME/ANSI B16.10

H. Lubricator and isolation valves for sliding stem valves

I. Matching actuator sized using maximum pressure drop across valve

J. Valve travel position graduations marked with "OPEN" and "CLOSED" at full travel limits

K. Filter-regulator with output air gauge

L. Stem close position within 1.0 percent of full travel when tested with bench set pressure

2.1.2.8 Solenoid Valve

A. 3-way

B. Direct-acting

C. 1/4 inch NPT process connections

D. 1/2 inch NPT conduit connection

E. Coil rated continuous-duty Class H as defined in UL 429

F. 120 Vac, 60 Hz coil actuation signal

G. NEMA 4X coil enclosure

H. Vented port opens upon deenergization

I. Bug-proof screen on vented port

J. 304L stainless steel body

2.1.2.9 Pressure Indicating Controller

A. Indicator with setpoint indication

B. 304L stainless steel body

C. 304L stainless steel wetted parts including Bourdon tube

D. 304 or 316 stainless steel movement

E. Local auto-manual switch

F. Accuracy of +/- 0.5% of calibrated span

2.1.2.10 Conductivity Analyzer

A. Accuracy +/- 1.0% of range

B. 0.01% / DEG F temperature stability

C. 4-20mA output

D. Auto-calibration using an internal reference resistance

E. NEMA 4X housing

F. Internal diagnostics sensing circuitry malfunctions and open or shorted electrode status

G. 316 stainless steel flow-through conductivity cell

2.1.2.11 Pressure Indicators

A. 4-1/2 inch dial

B. 1/2 inch male NPT process connection

C. 304L stainless steel wetted parts including Bourdon tube

D. 304 or 316 stainless steel movement

E. Vibration dampening

F. Blow-out back

G. Accuracy of +/- 0.5% of maximum reading over full-scale

2.2 FABRICATION AND MANUFACTURE

2.2.1 Instrument Mounting

2.2.1.1 Mount and support instruments and equipment in accordance with manufacturers' installation documents and Contract Drawings.

2.2.1.2 Adjustments shall be readily accessible, instruments and components shall be replaceable without disturbing wiring or other equipment.

2.2.2 Piping

Instrument pneumatic signal tubing shall be Type 316 stainless steel. Fittings shall be Type 316 stainless steel, Swagelok or equal. TFE tape shall not be used to seal threads of pneumatic instrument piping.

2.2.3 Wiring

Wiring material and installation methods shall comply with Section 16610.

2.3 FACTORY ACCEPTANCE TESTS

2.3.1 Prepare a Factory Acceptance Test (FAT) procedure and submit it for approval. Include:

Inspection/tests to demonstrate that the fabrication and assembly of the materials and equipment meet the requirements of the design drawings and specifications.

2.3.2 Inspect and test the instrument installations according to the Buyer approved FAT Procedure.

2.3.3 Submit a report confirming that the inspection and testing has been completed and the results.

2.4 **PACKAGING AND SHIPPING**

2.4.1 Reinstall shipping stops which were removed for calibration and testing.

2.4.2 Provide temporary additional shipping supports for instruments and equipment to be shipped mounted on mechanical equipment.

2.4.3 Repack loose instruments and equipment, including those removed from mechanical equipment for shipment, in the manufacturer's original packing material. Accumulate these in a separate crate marked "INSTRUMENTS" for shipment.

2.4.4 Protect all shipped materials from moisture, vibration, shock, and heat damage while in transit or interim storage. Crates and packages of instruments or components, which have been shipped separately, shall be identified and marked to be traceable back to the main equipment component.

PART 3 EXECUTION

(Not Used)

END OF SECTION

ATTACHMENT A

FURNISHED INSTRUMENTS - ELECTRIC STEAM GENERATOR

SERVICE DESCRIPTION	TAG NUMBER
Steam Generator Water Level	LIT-PRS-006
Steam Generator Pressure	PIT-PRS-008
Steam Generator Water Temperature	TI-PRS-009
Steam Generator Water Temperature	TW-PRS-009
Steam Generator Level	LG-PRS-011
Steam Generator Backpressure	PV-PRS-014
Steam Generator Backpressure	PIC-PRS-014
Steam Generator Outlet Emergency Shutoff	HY-PRS-014
Steam Generator Shutdown High High Pressure	PSHH-PRS-007

ATTACHMENT B

FURNISHED INSTRUMENTS - CHEMICAL FEED TANK

SERVICE DESCRIPTION	TAG NUMBER
Circulation Pump A Discharge Pressure	PI-PRC-032-2
Circulation Pump B Discharge Pressure	PI-PRC-030-1

ATTACHMENT C

FURNISHED INSTRUMENTS - BLOWDOWN TANK

SERVICE DESCRIPTION	TAG NUMBER
Blowdown Tank Level	LG-PRC-039

ATTACHMENT D

FURNISHED INSTRUMENTS - CIRCULATION PUMPS

SERVICE DESCRIPTION	TAG NUMBER
Chemical Feed Tank Level	LG-BFA-001
Chemical Feed Tank Low Level	LSL-BFA-004

ATTACHMENT E

OTHER FURNISHED INSTRUMENTS

SERVICE DESCRIPTION	TAG NUMBER
Steam Generator Water Conductivity	CIT-PRC-031
Steam Generator Water Conductivity	CE-PRC-031

SECTION 17871A
SAFETY CLASS RELIEF VALVES
FURNISHED WITH ELECTRIC STEAM GENERATOR
(SAFETY CLASS 1)

PART 1 GENERAL

1.1 SUMMARY

This section defines the requirements for the supply, installation, inspection and testing of two safety class relief valves PSV-PRS-081 and PSV-PRS-086 furnished with the Electric Steam Generator specified in Section 15620.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ANSI B16.5	1988 Pipe Flanges and Flanged Fittings; Errata - October 1988
SECTION I Part PEB	1989 Boiler and Pressure Vessel Codes, Section I, Rules for Construction of Power Boilers
SECTION III, Division 1, Subsection ND	1989 Boiler and Pressure Vessel Codes, Section III, Rules for Construction of Nuclear Power Plant Components, Class 3 Components

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S20	1981 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 15620	Electric Steam Generator

1.4 **DEFINITIONS**

BPVC - Boiler and Pressure Vessel Code

DEG F - Degrees Fahrenheit

FAT - Factory Acceptance Tests

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Catalog cuts describing each relief valve and accessories.

1.6.2 Manufacturer's installation drawings and instructions.

1.6.3 Manufacturer's operating, and maintenance manuals in accordance with Specification Section 01730.

1.6.4 Instrument data sheets similar to ISA S20, completed in accordance with ISA S20 instructions.

1.6.5 Instrument sizing calculations and formula including the name, manufacturer, and serial number of any computer programs used in sizing.

1.6.6 FAT procedure.

1.6.7 Inspection/Test Report in accordance with Paragraph 2.3.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1)	Maximum Design Temperature	110 DEG F
2)	Minimum Design Temperature	-20 DEG F
3)	Wet Bulb Design Temperature	68 DEG F

1.8.2 Operating Environment

A.	Normal Indoor Temperature	60 DEG F to 104 DEG F
B.	Maximum Temperature	104 DEG F
C.	Relative Humidity	Not Controlled

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

2.1.1 General

When two or more components with the same specifications are required the components shall be identical. (Same manufacturer and catalog number.)

2.1.2 Steam Safety Relief Valves shall include the features listed below:

A. Meet requirements of ASME BPVC Section I, Part PEB and Section III, Subsection ND.

B. No "N" code stamp required.

C. Cast carbon steel body.

D. Flange end connections per ASME/ANSI B16.5.

E. Each valve sized for 100 percent relieving capacity without chattering.

F. System design temperature of 390 DEG F.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

2.3 **FACTORY ACCEPTANCE TESTS (FAT)**

2.3.1 Inspection/tests to demonstrate that the fabrication and assembly of the materials and equipment meet the requirements of the design drawings and specifications.

2.3.2 Inspect and test the relief valves according to the Buyer approved FAT Procedure.

2.3.3 Submit a report confirming that the inspection and testing has been completed and the results.

2.4 **PACKING AND SHIPPING**

2.4.1 Repack relief valves in the manufacturers' original packing material. Accumulate these in a separate crate marked "INSTRUMENTS" for shipment.

2.4.2 Protect all shipped materials from moisture, vibration, shock, and heat damage while in transit or interim storage.

PART 3 EXECUTION

(Not Used)

END OF SECTION